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# MOTOR AGE

Volume XXXV  
Number 8

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CHICAGO, FEBRUARY 20, 1919

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# MOTOR AGE

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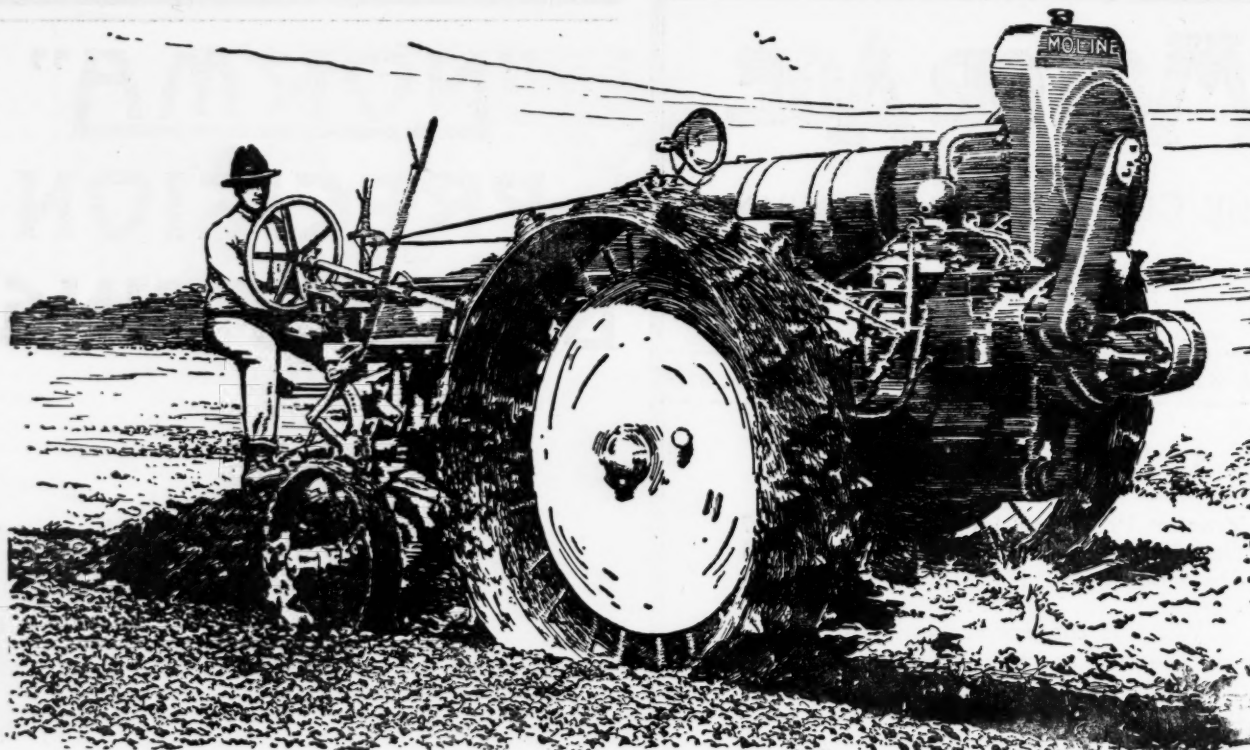


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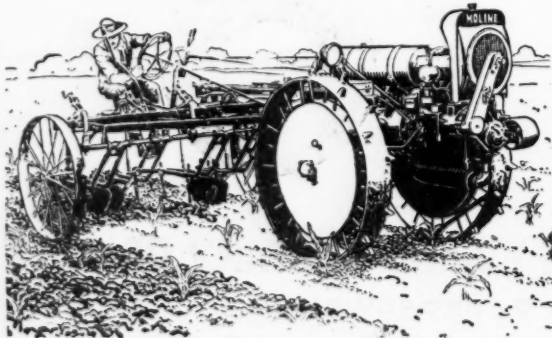
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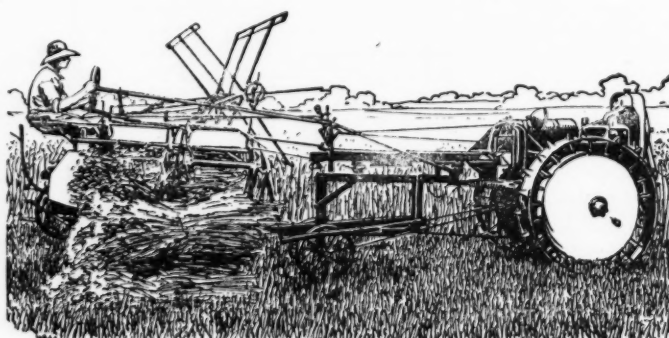
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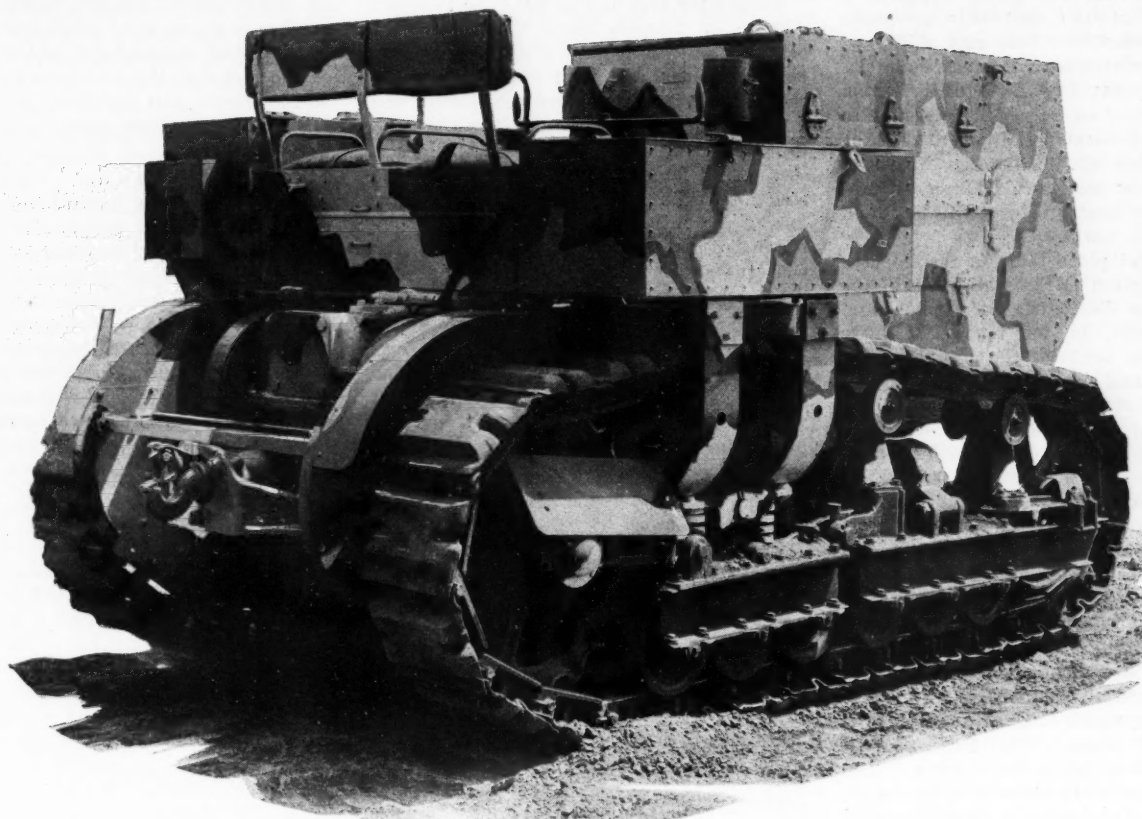
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# MOTOR AGE



This camouflaged 10-ton Holt ordnance tractor symbolizes the return of tractor production to peacetime extension, for Holt is back on the market with a 10-ton farm tractor and is going to show this and others at Kansas City and practically all other tractors made will be there

## *Stage Set for Farm Tractors*

**Kansas City and Minneapolis Attract About Every Make in Production—Diversity of Types Still Marked but Designs Show Improvement**

SHOWING at Minneapolis this week, and to be shown at greater extent at Kansas City next week, are practically all the farm tractors in production and which will be available for use on the farms of the country during 1919. Among the models on exhibition, and particularly is this true of the National Tractor Show which will open this Saturday at Kansas City, are many which never have been shown before at a national show. Some of these are brand new and are making their initial bow to the public. Others are not new in the same sense, since some of them were developed during the last year and have been more or less in production for

By Fred M. Loomis  
*Motor Age Editorial Staff*

some time. Certain of these recently developed models also were shown locally last fall at state fairs and conventions but now are making their first appearance at a real national show.

At Kansas City there will be far more of these new models than at Minneapolis. At the latter show distinctively new models are not numerous, as is indicated in the report of the show which appears in this issue of *MOTOR AGE*, while at Kansas City the new models will be a distinct feature. This probably is

because the National Tractor Show at Kansas City will be exclusively a tractor, tractor accessory and power equipment display, while Minneapolis is an automotive show, combining tractors, trucks and motor cars. Also the location of Kansas City attracts a more comprehensive display of tractor makes and models because it is nearer the center of the territory which will absorb a greater number and variety of tractors than will that territory which is tributary to Minneapolis.

Largely for the latter reason the Kansas City show will be comprehensive and will be as well representative of the great strides that have been taken during the last year in

the design and construction of tractors that are dependable, efficient and economical in operation. For great progress has been made, and that too during a comparatively short time. What was considered to be practically the last word up to that time in tractor construction was shown at Salina last summer. Since that time, in part due to some of the lessons learned at that greatest of all power farming demonstrations, improvements have been made on old models and entirely new models have been developed, and all that thus is new will be shown at Kansas City.

The Kansas City show will have a two-fold importance. In the first place it will be a demonstration of the fact that enormous amounts of money, the time and ability of many men, business men, engineers and laborers, the concentrated force of invention and construction, all are being devoted to the design and construction of a class of equipment which shall make the American farmer the most successful, the most productive and the most prosperous to be found anywhere in the world.

In the second place there is the impetus which will be given to the realization of the fact that in the distribution of tractors and power equipment, in the taking of these things from the hands of the engineers and the producers and placing them in their appropriate environment on the farms of the country, there is an industry which is of sufficient importance to enlist the best ability and talent of the best retail merchants of the country. And it is this second phase of importance, which the Kansas City show will present, which is the most significant and which is the most deserving of the thoughtful attention of the thousands of men who will make of Kansas City a mecca next week.

In transforming American agriculture from the slow, inefficient and uneconomic industry it has been under the horse regime into the vastly more rapid, efficient and economic industry it will become under the motorized regime, there is a sphere for work and usefulness which presents attractions to the retail merchant rivaled only by those presented by other departments of the automotive industry. Just because the tractor itself is automotive is a reason why men already interested or engaged in the selling of automotive equipment will find encouragement and inspiration at the Kansas City show.

#### Rapidity of Transformation

Few who have not given special attention to the matter realize the rapidity with which the farms of the country are being transformed from the horse basis to the mechanical basis. As an aid to agriculture the gas tractor was almost a negligible factor five years ago. Of course, there were tractors then, many of them as far as variety of design was concerned, but numerically so few were doing actual work upon the farms that their influence, except potentially, hardly was worth taking into account. Compared with the number of farms in the United States which can accommodate a tractor economically, there still are pitifully few at work even after the building of years. Yet what has been accomplished in this direction is important and significant.

Industrially, the tractor just is getting into its stride. Prior to 1916 manufacture was confined to relatively few concerns, many of whom built large machines almost exclusively, machines which hardly would be considered

in the classification of farm tractors. During 1915, however, many real farm tractors were being tried out, many of which got safely past the experimental stage and into production during 1916. Governmental investigations place the production of tractors for 1916 at 29,670, of which number 27,819 were sold to the farmers of this country, the remainder being sold abroad.

Production during 1917 showed an increase of 135 per cent as compared with 1916, the total figures being 62,742. Of this number 49,504 went onto American farms and 14,854 were exported.

During the first half of 1918 the total production of tractors reached 58,543, almost as many as were made during the preceding twelve months, and if it had not been for the restrictions placed upon the tractor manufacturers by the Government it is altogether probable the second half of 1918 would have seen a still larger production. However, restrictions were placed upon production, reducing the output of those concerns already producing and totally preventing many other concerns about to get into production from doing anything at all.

No reliable statistics are available at this time upon which to base an estimate even of what the tractor manufacturers accomplished between July 1, 1918, and Jan. 1, 1919. The probabilities are that the total production of tractors for 1919 fell considerably below the 100,000 mark, but, even so,

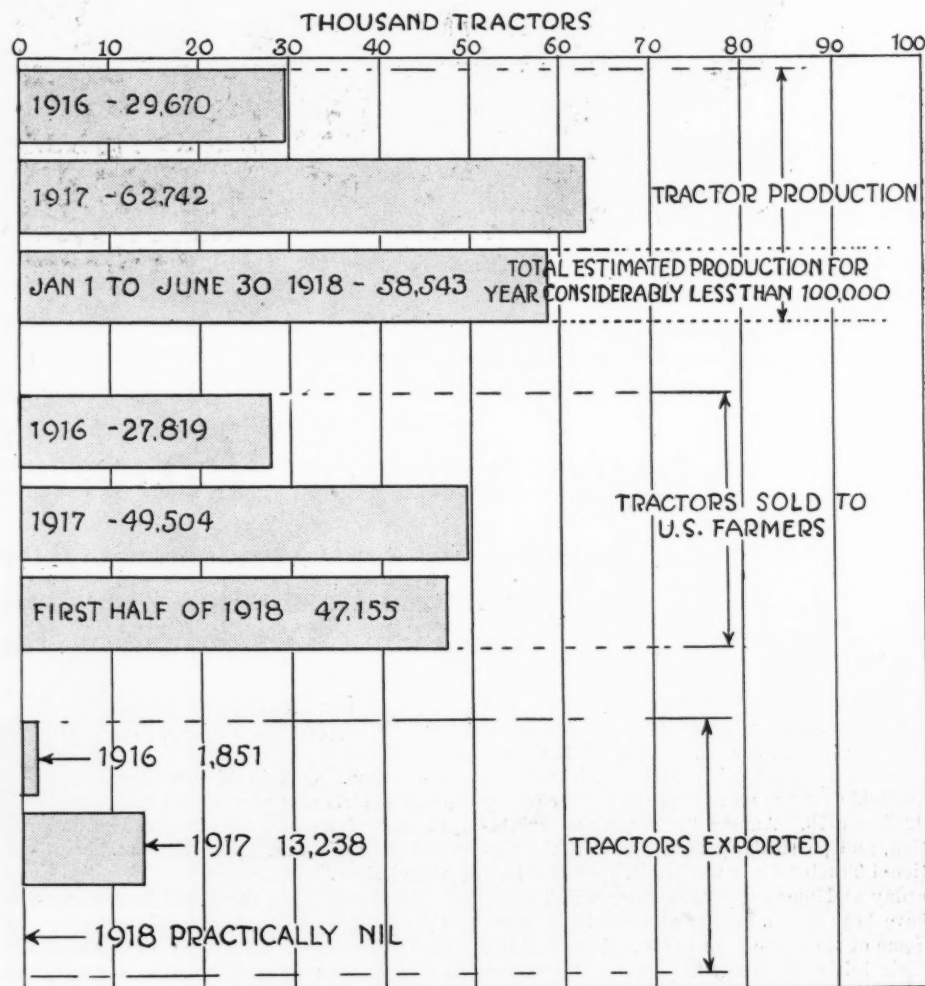
this showed a very substantial increase over 1918.

Furthermore, as the Government investigation showed only 11,388 tractors in the hands of manufacturers and dealers on Aug. 1, 1918, and as exportations practically were nil, it is evident that a very large proportion of the tractors produced in 1918 went directly to work upon the farms of this country.

While it is merely speculative, there being no reliable information on the subject, it is probably safe to estimate the number of tractors now opened by farmers as approximately at about 140,000. This, of course, is an insignificant number relatively to the number of farms upon which a tractor might be employed economically, but it is evidence of the fact that the American farmer is sold on the tractor and that the pioneering in its introduction has been done.

#### Production for 1919

What the production will be for 1919 is entirely problematical at this time, but as far as it is safe to deduce from the reports received, it is not improbable to conclude that 1919 will considerably more than double the production of 1918. Concerns which already lead in production are preparing to increase their output largely, while other concerns will enter the production field with large facilities during the year. In some cases these new concerns are preparing for a very large production, and plants now under construction



These figures are estimates only, as an exact record is unavailable. The total tractors in the hands of United States farmers is estimated at 140,000

likely will be turning out hundreds of tractors a day before the end of the year. In other words, the tractor has arrived.

Tractor design and construction are moving along certain well-defined lines. The majority of the tractors now on the market, under competent operation, will do what it is claimed they will do. Manufacturers of tractors have learned from their experience during the last few years—sometimes costly experience, too, but nevertheless necessary experience—what a tractor must be to meet the needs of the individual farmer under diversified conditions, and henceforth they can build that kind of a tractor and offer it to the farmer in the comfortable assurance that it will meet his needs, whatever these may be.

This has been attained by the development of diversified types and sizes of tractors. There is no standard tractor. In all probability there never will be. The very diversification found in agricultural need, due to differences in location, character of soils, variety of crops and multiplicity of combinations of all these facts, make it impossible that there ever shall be a standard, general all-purpose tractor which shall be universally applicable to all manner of conditions. The very diversity of the lines along which tractor development has progressed has been the best possible thing for the tractor industry and for the farmer, and this fact is another which will receive confirmation at Kansas City.

#### Great Progress Made

This does not imply that the goal in tractor development has been reached. Not by any manner of means. It means merely that great progress has been made and that while ultimate perfection still is far distant, there has been wholesome and healthy diversification in the line of progress which has made the tractor already the most efficient power agent which ever has been presented to the farmer and which in its very variety comes nearer meeting the need of the individual farmer than has any previous mechanical agent.

For the dealer who goes to the Kansas City show to consider the tractor as a means for employing his selling ability, this is a fact of profound importance. An industry which reached a production figure of 100,000 during the war conditions of 1918, and which has its product developed to such a point that generally speaking it is dependable, and which produces something for which there is

not only a potential but an actual demand in excess of possible production for years to come, presents attractions which the keen witted and capable dealer will not ignore.

The tractors which will be shown at Kansas City are not put forward in an experimental way. As they will appear, with the improvements and refinements which have been put on them during the last year, they are competent and dependable machines. This applies to those models which are called new, as well as to those which merely are old models embodying new features. In nearly every case of both new and old the machine as shown is the result of evolution, evolution directed by actual experience. The trend all along has been to retain features which have made good under trial and to change only those features which experience has shown might or must be improved. The result has been a general movement in the direction of a more dependable tractor, regardless of whether there has been any convergency of ideas toward standardization of type. There has been very little of this latter, as a matter of fact, those machines which have been longest in the field remaining fundamentally distinct and changing only in minor details.

The probable effect of the Kansas City show will be to establish the tractor firmly in the mind of the dealer as a desirable thing to sell. He will become convinced that the tractor, still imperfect as it may be, nevertheless is a product which he can afford to sell and upon which he can rest his reputation as a reliable business man. He will see in the tractor the opportunity to ally himself with that factor destined to make the American farmer the most prosperous and efficient farmer in the world and he will be encouraged to do his part in bringing that about. The dealer who goes to Kansas City and sees there congregated an array of tractors such as never was presented before will go back home determined to increase his effort. He will have his ambitions aroused to excel as a tractor salesman. He will have determined to persevere and to hold to his place in the development of what is destined to be one of the greatest movements in the history of the world, that toward the eventual motorization of agriculture.

Another certain effect of the Kansas City show will be to check the tendency, if any such exists, to drop the tractor now that other kinds of automotive equipment once

more are on the market. During the stress of war conditions many dealers took on the tractor. Some of these regarded it as an emergency proposition at the time and since hardly have had time to accommodate themselves to the requirements of the tractor business. Now that events have made it not so essential to the dealer some of them are hesitating as to whether they shall continue in the tractor trade or abandon it. The Kansas City show will help them to make up their minds and to decide finally to stick. The demonstration that will be made will be confirmatory evidence of the justness of the dealer's first impression that the tractor trade will be something well worth his while and that, having made the first plunge, he should stay with it.

The assurance that the tractor has been developed until it is in general dependable, as will be one of the most conclusive of the demonstrations of the show next week, coupled with the assurance that the market for tractors is sure and growing, should act upon the mind of the dealer with convincing force and should emphasize his determination to push the tractor department of his business for all he is worth.

#### Prospects for Sales

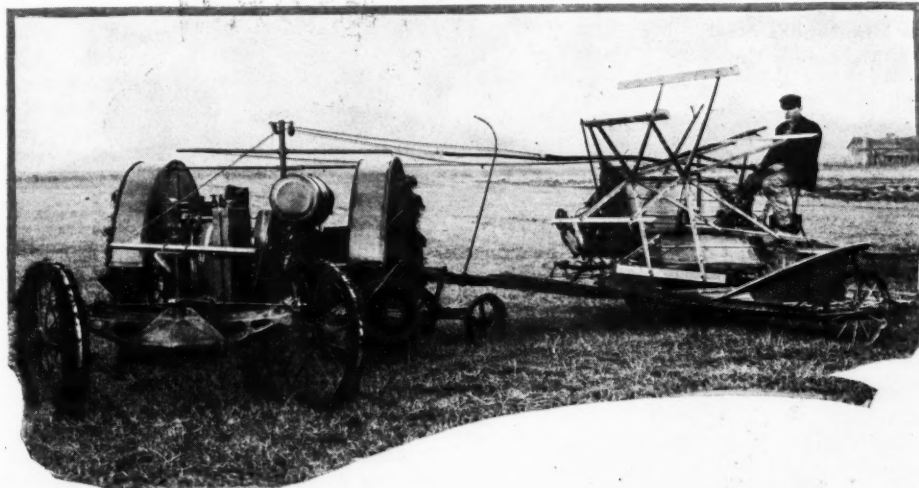
What is the market? It will be found among that class which at present has the largest potential buying power of any class in the country, namely, the farmer. Not only has he had two of the most prosperous years in his history, but this year he will have handed to him, as it were in a silver platter, nearly \$2,000,000,000 by the Government which must make good on its guaranteed prices for wheat and hogs. This enormous amount of money the farmer will have available for the purchase of those things he wants and needs and millions of it with positive certainty will be spent for better equipment, and this means power equipment—tractors and tractor-drawn implements. What these millions of dollars will be spent for the dealer will see at Kansas City.

There will be much that is new there. There will be many new models which will be shown for the first time and there will be many others which have been developed during the last year, some of which may have been displayed locally here and there, but which will be making their first appearance at a national tractor show.

Also there will be brought out clearly the lines along which tractors are developing. Side by side will be seen the tractors with the horizontal engines and those which have adopted the vertical type motor car engine.

Also there will be brought into contrast the small two-bottom tractor and the tractors of three- and four-bottom capacity. It is an interesting question in the tractor trade which of these two sizes will meet with the greater production and sale during the future. Only the future will decide, of course, but the interest of the comparison will be emphasized at Kansas City.

Also there will be a comprehensive display of tractor-drawn and operated equipment, from plows to threshing machines. It is becoming more and more evident that the tractor dealer of the future must of necessity be the dealer who sells the capacity equipment which will be used with tractor. This is an inevitable development of the trade. It is fitting and right, therefore, that such



The La Crosse model G tractor with line drive is to be driven overland from Alton, Ill., to Kansas City

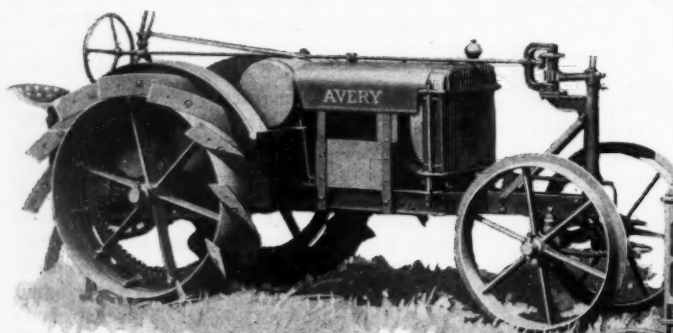
## Some Tractors You Will See at Kansas City



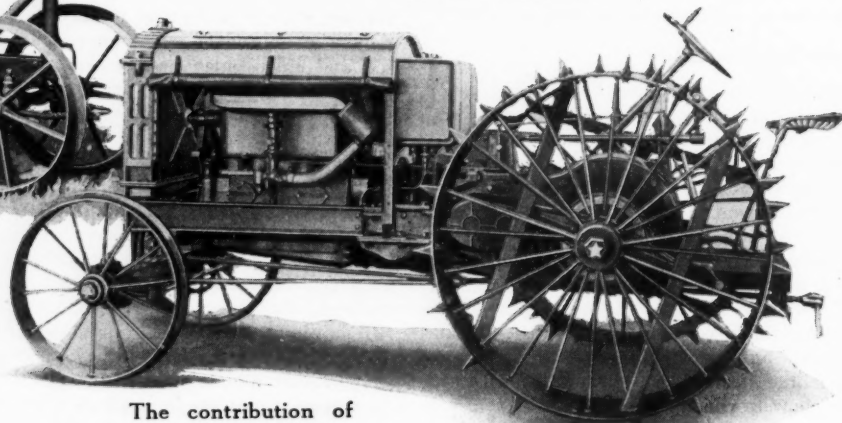
This is the new 14-28 member of the Avery family of tractors



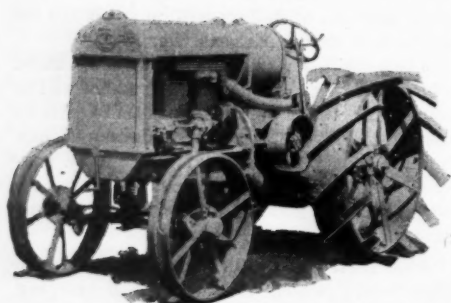
The Townsend perpetuates the appearance of the steam tractor of former days even though it is a gasoline machine



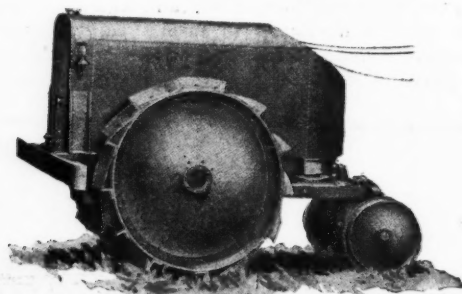
What the remodeled Avery B 5-10 looks like



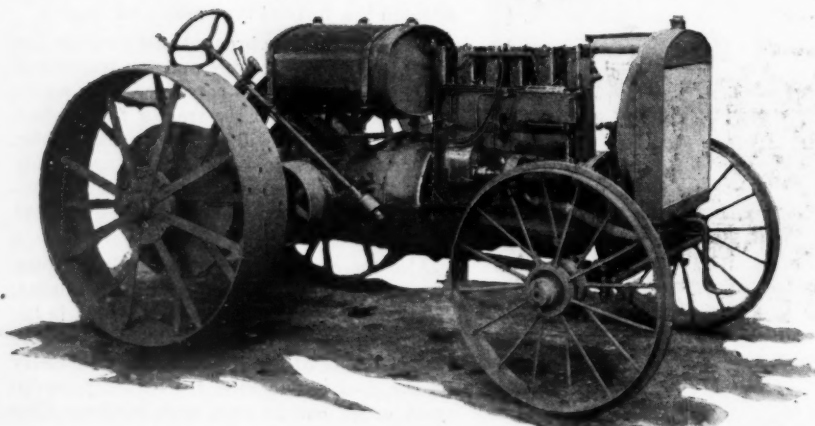
The contribution of the new Bethlehem Motors Corp. to the farmer



The new 12-20 Twin-City brought out by the Minneapolis Steel & Machinery Co.



This is the Automotive one-man tractor with line control



Here is the new 18-30 Allis-Chalmers farm tractor

equipment be made a constituent part of a tractor show and this year this will be done to a greater extent than ever before. This part of the show, too, will be as replete with interest for the visiting dealer as will be the tractors themselves.

In addition there will be shown what has been done to date in the development of general-purpose tractors and motor cultivators. This will comprise an interesting part of the show and will be very much worth while the attention of the dealer. There is good reason to think that the general-purpose tractor and the motor cultivator, with the modifications and adaptations of which they are capable, will go further toward the ultimate and complete motorization of the farm than will the tractor.

On the tractors with which the trade has

become relatively familiar there will be seen many improvements and refinements. Better engineering principles are being employed in tractor design, and while fundamentally there may not have been many radical changes in the old favorites, still many of the well known tractors will present minor changes, most of them for the better.

Then there are new things in tractor accessories, starters, thermostatic regulation of temperature, improved air cleaners and washers, better carburetion devices for the handling of present day fuels, improvements in ignition and governing devices and many other things of the like in which the dealer will be interested. In short, the Kansas City show promises to be an epitome of all that is new and best in the tractor field and as such it will be very much worth while.

## New Tractors for Kansas City

IT IS impossible to list, before the opening of the National Tractor Show, all the new models which will be found at Kansas City Feb. 24-March 1. It always is, for that matter, as some of the tractor makers prefer to withhold details on their new offerings until the opening of the event itself. But herewith are described a few of the new tractors and other exhibits which will be there. The show report proper will give you information as to the rest of the new models and exhibits.

### Automotive

One of the really novel exhibits at Kansas City will be the Automotive one-man line-control tractor, manufactured by the Automotive Corp., Fort Wayne, Ind. The one-man Automotive was designed to meet the theory that economic tractor operation demands a one-man machine which can at all times be driven from the seat of the implement or vehicle to which the tractor is attached.

The Automotive one-man tractor has a rating of 15-30 and practically is carried on the two drive wheels, the small wheeled truck at the rear of the machine bearing but 10 per cent of the total weight. The tractor steers by the power of its own engine, the steering mechanism being operated by lines or reins which extend from the tractor back to the operator on the seat of the implement behind. A description of the steering mechanism, without explanatory illustrations, sounds complicated, but in reality it is said to be very simple and efficient. It must be seen, however, to be understood.

The Automotive has a Buda engine, Torbensen axle, Kingston carbureter, Eisemann magneto, Stewart vacuum feed and Hyatt and Timken bearings. The transmission, steering device, gear shifting device and disk wheels are of the company's own design. As a distinct novelty in the tractor line the Automotive will attract a deal of attention.

### Avery

While the Avery Co., Peoria, Ill., will exhibit the complete Avery line of tractors, seven models in all, only the 14-28 and the little B 5-10 will be new, the latter being shown at the national show for the first time.

The present B 5-10 departs considerably in appearance from the former model. It has been shortened and made more compact. The operator sits now at the extreme rear of the machine instead of amidships as before. The fuel tank has been moved forward into closer proximity to the engine. The goose neck construction at the front end of the frame has been abandoned and the shortening of the frame brings the bull pinion into mesh with the rear segment of the bull gearing instead of with the front segment as in the old model.

On Tuesday of the show week in Kansas City, two solid trains of about forty cars each, loaded with Avery tractors, will arrive from Peoria, Ill. All these tractors will be delivered to Avery dealers in Kansas and Oklahoma. This is said to be the largest single shipment of tractors ever made to dealers in any part of the country.

### Allis-Chalmers

Two new models will be shown by the Allis-Chalmers Mfg. Co., Milwaukee, Wis. One, the general-purpose tractor, was developed during 1918 and has been shown before at state fairs but never before at a national show. It is a two-wheel, light construction tractor, with a four-cylinder, L-head engine with  $3\frac{1}{2}$  by  $4\frac{1}{2}$ -in. bore and stroke and is capable of developing a drawbar pull of more than 1,000 lb. The company claims the general-purpose machine will do four-horse work in planting, disking, harrowing, cultivating and harvesting. While it was not de-

signed specifically for corn cultivation, it has clearance enough and power enough for a two-row corn cultivator and has been used successfully for such work. In view of the interest which is being taken in the possibilities of general-purpose tractors and motor cultivators this model will receive marked attention.

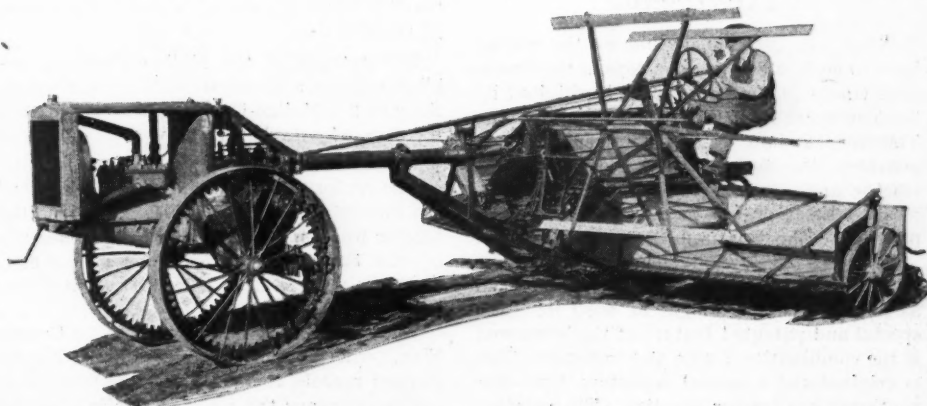
The other Allis-Chalmers model is distinctly new. It has a rating of 18-30 and has been specially designed and built for three- and four-plow requirements. It is the four-wheel type with a four-cylinder, kerosene-burning engine. The engine has  $4\frac{1}{4}$  by  $6\frac{1}{2}$ -in. bore and stroke and develops about 37 hp. at 900 r.p.m. The cylinders are cast in block with removable sleeves. The valves are in the head, inclosed and dust proof. Lubrication is by combination splash and force feed from a force feed lubricator outside the engine. Roller bearings are used throughout. Drive is through a sliding gear transmission with a speed range of 2.3 to 2.8 m.p.h. forward and one reverse. Final drive is inclosed. The drive wheels are 50 in. in diameter with 12-in. face.

### Bethlehem

One of the tractors which will make its initial bow at the National Tractor Show at Kansas City is the new 18-36 Bethlehem, made by the Bethlehem Motors Corp., Allentown, Pa. The Bethlehem tractor is of the conventional four-wheel type, with Beaver, four-cylinder, vertical, valve-in-head engine with  $4\frac{1}{4}$ -in. bore and 6-in. stroke. Lubrication is splash, and the cooling system is forced circulation by a centrifugal pump. The assembly includes standard equipment, such as Bennett air cleaner, Stromberg carbureter, Bosch magneto with impulse starter and Hyatt and Timken bearings. The Bethlehem is a live-axle machine with final drive through spring-cushioned driving spiders. The complete drive is inclosed and runs in oil. The wheels, both front and rear, are of the round-spoke type. The drive wheels are 54 in. in diameter and are cross braced. The Bethlehem has a sturdy appearance and looks as though it were built for hard work.

### Case

The J. I. Case Threshing Machine Co., Racine, Wis., will exhibit the 10-18 model and the new 15-27 model, both of which have been described in detail in previous issues of MOTOR AGE. The new model 15-27 made its first appearance at the Salina demonstration



This is the general purpose Allis-Chalmers tractor developed during 1918

last summer and will make its debut at a national show at Kansas City. Practically, it is identical with the 10-18, only larger and more powerful.

What will prove to be the attractive feature of the Case exhibit will be a specially finished cut-open 10-18 chassis. This will be live—that is, all parts will be in motion and the entire outfit will be mounted on a revolving pedestal so that the tractor may be presented to the spectator from every angle. A cut-open 10-18 one-piece cast main frame, which is a distinct feature of Case design, also will be shown. This will reveal the manner of installation of shafts and roller bearings and will show how perfect alignment is maintained in the Case machine.

The company also will display a Case 20 by 36 steel threshing machine, equipped with Case feeder, wind stacker and weigher. The panels of this machine will be removed to expose the interior working parts.

## Minneapolis

For the first time in the history of tractor construction a sixteen-valve-head engine will be shown at Kansas City. This extreme adaptation of motor car practice to tractor use is the engine in the new 12-20 Twin-City, manufactured by the Minneapolis Steel & Machinery Co., Minneapolis, Minn.

The new 12-20 is of the conventional four-wheel type and is light for its power, weighing but 4,000 lb. empty. The engine is of the four-cylinder, vertical type, the company's own design, and has a 4½ by 6-in. bore and stroke. Aside from the double number of valves the engine presents no other specially novel features except that it is equipped with a Slyphon thermostat. Of course, this is not entirely new in tractor practice since at least two other makes of tractors have thermostats, but its installation on the Twin City is indicative of the trend toward the employment of devices for the control of temperatures the better to use present-day fuels.

It is claimed that the 12-20 will develop 35 hp. on kerosene and 40 hp. on gasoline, thus presenting a very large reserve of power. The company claims this is one result of the sixteen-valve construction.

Special features on the 12-20 Twin City are the built-in, sealed Pierce governor which maintains the engine at 1,000 r.p.m., the transmission, which is of the company's own design, and the extreme accessibility of the construction.

## Townsend

What will carry the mind of the visitor back to early steam tractor days is the Townsend tractor, manufactured and exhibited by the Townsend Mfg. Co., Janesville, Wis. The Townsend maintains in general external appearance the form of the old-time steam tractor and is a case of the application of steam tractor design to modern gas tractor practice. The Townsend is unique in this.

It has a two-cylinder, horizontal engine with a 6½ by 8-in. bore and stroke and rates as a 12-25, with a weight of 6000 lb. The special and patented feature of the Townsend is the combination frame and radiator. This is original and a radical departure from conventional gas tractor practice. The radiator is constructed similar to a steam boiler. The

shell is fitted with heads and a sufficient number of standard boiler tubes, through which cold air is drawn by the exhaust for cooling the water. It is made of heavy boiler plate, with seams properly riveted, insuring a rigid foundation for the engine and transmission parts, as well as providing a large and durable radiator. The cooling water is forced from the radiator through the cylinder jackets by a circulating pump which is belt driven. The engine is a two-cylinder, moderately-speeded engine that starts and operates on kerosene. The transmission is made up of wide-faced spur gears running in plain babbitted bearings, replaceable in the field, and all parts likely to wear are inclosed. Steering is plain worm gear and chain type. Lubrication is by sight feed oiler. Ignition is jump spark from high-tension magneto.

The company is building a new model to rate at 15-30 but which could not be got ready in time for the Kansas City show. The same general design is followed in the new model, but it is larger and stronger in every way. The engine has a 7 by 8-in. bore and stroke; the front axle construction has been changed by the constitution of an I-beam section for the round section in the earlier model; motor car type steering device replaces the worm gear and chain type of the smaller machine, and the new model will be equipped with a steel cab, with removable top. The company expects to be making deliveries on the new 15-30 by March 15.

## Miscellaneous

There will be many exhibits at the show which will present unusually interesting features. In some instances there will be reminiscences of the stress the tractor industry has gone through during the recent war period. One such will be the display of the Holt Mfg. Co., Peoria, Ill. The Holt company will exhibit a 20-ton British War Department caterpillar, a 10-ton United States Ordnance caterpillar and two agricultural caterpillars, one a 10-ton and the other a 5-ton. The last named will be a new model and will mark the re-entrance of this company into the agricultural field.

The Advance-Rumely Co. will exhibit four tractor models, a cutaway engine operated by electricity and a half-skeleton 22-36 separator.

The Emerson-Brantingham Co., Rockford, Ill., will exhibit several tractor models and a line of tractor implements. The special features of the E-B exhibit will be a cut-out tractor chassis operated by electricity and the E-B 12-20 AA model, which is the newest of the E-B line.

The feature of the Moline Plow Co. exhibit will be a demonstration of the versatility of the Moline-Universal tractor through its ease of attachment to various kinds of farm operative equipment.

The center of attraction in the exhibit of the Parrett Tractor Co., Chicago, will be the tractor which made the 100 hr. endurance run at the Salina demonstration last summer. Cutaway units will be a feature of this display as well.

While the La Crosse Tractor Co., La Crosse, Wis., will have on display both Happy Farmer models, the three- and the four-wheel models, perhaps the most interesting will be outside the show proper. This will consist

of a model G Happy Farmer attached to a service wagon with inclosed cab and windshield and a 170-bu. grain tank, all entrain. The tractor will be driven by lines which will extend through slots in the windshield to the driver's seat on the service wagon. The company's distributor for eastern Missouri and southern Illinois will have driven this outfit to Kansas City from Alton, Ill.

The Russell & Co., Massillon, Ohio, will exhibit three new models which have been developed especially for the 1919 trade and the 40-80 Giant, retained from the old line. Distinctive features of Russell design are an arrangement of the transmission whereby the tractors have two speeds forward, both operating on a direct drive, and a power take-off from the same transmission operated by a lever at the side of the driver's seat.

### Aultman-Taylor

The 22-45 Aultman-Taylor, manufactured by the Aultman-Taylor Machinery Co., Mansfield, Ohio, is exhibited at Minneapolis this week and will be shown for the first time in the Southwest at the Kansas City show. It takes the place of the 18-36 and 25-50 models the company heretofore has manufactured, reducing the line to three models, the 15-30, the 22-45 and the 30-60, all of which will be shown. The new 22-45 differs very little from the old 18-36 except in the bore of the engine, while the only change on the 15-30 is a change in the length of the hood.

The Hart-Parr Co., Charles City, Iowa, will make the new 15-30 model, which attracted so much attention at the Salina demonstration last summer, the feature attraction of its display.

The Indiana Silo Co. will show a model of a small general-purpose tractor which made its first real appearance at the Indiana state fair last fall, then under the name of the Star. This will be the first time this tractor has been shown in the Southwest.

The feature of the John Lauson Mfg. Co. display which certainly will attract a good deal of attention, is the Christenson starter, which now is regular equipment on the Lauson. The Lauson had a starter installation at the Salina demonstration last summer, but since that time a specially designed model for tractor service has been developed and this is what will be shown at Kansas City.

The Craig Tractor Co., Cleveland, Ohio, has designed an entirely new tractor which it is hoped to have in readiness for exhibition at Kansas City. It is said the new model differs materially from that shown at the Pier show in Chicago last fall.

### Samson Absent

There will be universal disappointment over the inability of the Samson Tractor Co., Janesville, Wis., to make a display of the Samson line. War restrictions on building delayed the completion of the assembly plant at Janesville until it was impossible to get tractors out in time for the Kansas City show. The first unit of the building will have been completed within thirty days, however, and very soon thereafter model M and model D Samson tractors will be ready for distribution. The Samson line ultimately will consist of three tractor models and a motor truck. An exhibit of specially designed capacity equipment for tractors will be made, however, by the Janesville Machine Co.

# List of Exhibitors at Kansas City Tractor Show

Tractors.	
Acme Harvesting Machine Co.	Peoria, Ill.
Advance-Rumely Thresher Co.	La Porte, Ind.
Allis-Chalmers Mfg. Co.	Milwaukee, Wis.
Aultman-Taylor Machinery Co.	Mansfield, Ohio
Avery Co.	Peoria, Ill.
Automotive Corp.	Fort Wayne, Ind.
Bethlehem Motors Co.	Allentown, Pa.
Bull Tractor Co.	Minneapolis, Minn.
J. I. Case T. M. Co.	Racine, Wis.
Cleveland Tractor Co.	Cleveland, Ohio
Coleman Tractor Co.	Kansas City, Mo.
Craig Tractor Co.	Cleveland, Ohio
Culto Tractor Co.	Detroit
Dart Truck & Tractor Co.	Waterloo, Iowa
Dayton-Dick Co.	Quincy, Ill.
Electric Wheel Co.	Quincy, Ill.
Emerson-Brantingham Implement Co.	Rockford, Ill.
Engel Aircraft Co.	Niles, Ohio
Frick Co.	Waynesboro, Pa.
Gray Tractor Co.	Minneapolis, Minn.
Hart-Parr Tractor Co.	Charles City, Iowa
Henry Ford & Son.	Dearborn, Mich.
Holt Mfg. Co.	Peoria, Ill.
Huber Mfg. Co.	Marion, Ohio
Illinois Silo & Tractor Co.	Bloomington, Ill.
International Harvester Co.	Chicago
John Deere Plow Co.	Moline, Ill.
John Lauson Mfg. Co.	New Holstein, Wis.
Kansas City Hay Press Co.	Kansas City, Mo.
Kinnard & Sons Mfg. Co.	Minneapolis, Minn.
LaCrosse Tractor Co.	LaCrosse, Wis.
Liberty Tractor Co.	Minneapolis, Minn.
Minneapolis Steel & Mach. Co.	Minneapolis, Minn.
Moline Plow Co.	Moline, Ill.
National Tractor Co.	Cedar Rapids, Iowa
Nelson Tractor Co.	Minneapolis, Minn.
Parrett Tractor Co.	Chicago
Port Huron Engine & Thresher Co.	Port Huron, Mich.
Rock Island Plow Co.	Rock Island, Ill.
The Russell Co.	Massillon, Ohio
E. G. Stauder Mfg. Co.	Minneapolis, Minn.
Townsend Mfg. Co.	Janesville, Wis.
Turner Mfg. Co.	Port Washington, Wis.
Velle Motors Corp.	Moline, Ill.
Wallis Tractor Co.	LaCrosse, Wis.
Wichita Tractor Co.	Wichita, Kan.
Plows	
B. F. Avery & Sons Plow Co.	Louisville, Ky.
J. I. Case Plow Works.	Racine, Ill.
J. I. Case T. M. Co.	Racine, Wis.
John Deere Plow Co.	Moline, Ill.
Grand DeTour Plow Co.	Dixon, Ill.
Janesville Machine Co.	Janesville, Wis.
LaCrosse Plow Co.	LaCrosse, Wis.
Oliver Chilled Plow Co.	South Bend, Ind.
Parlin & Orendorff Plow Co.	Canton, Ill.
Rock Island Plow Co.	Rock Island, Ill.
Roderick Lean Mfg. Co.	Mansfield, Ohio
South Bend Chilled Plow Co.	South Bend, Ind.
Vulcan Plow Co.	Evansville, Ind.
Tractor Engines	
Buda Co.	Harvey, Ill.
Climax Engineering Co.	Clinton, Iowa
Hercules Motor Co.	Canton, Ohio
Toro Motor Co.	Minneapolis, Minn.
Tractor Engine Co.	Boone City, Mich.
H. J. Walker Co.	Cleveland, Ohio
Waukesha Motor Co.	Waukesha, Wis.
Bearings	
Gurney Ball Bearing Co.	Jamestown, N. Y.
Hyatt Roller Bearing Co.	Chicago
Lumen Bearing Co.	Buffalo, N. Y.
S. K. F. Administrative Co., Inc.	New York
Timken Roller Bearing Co.	Canton, Ohio
Standard Parts Co.	Cleveland, Ohio
U. S. Ball Bearing Mfg. Co.	Chicago
Oils and Greases	
Balso Oil Co.	Council Bluffs, Iowa
Bates Oil Co.	Council Bluffs, Iowa
Monarch Mfg. Co.	Council Bluffs, Iowa
Mutual Oil Co.	Kansas City, Mo.
National Refining Co.	Kansas City, Mo.
Standard Oil Co.	Kansas City, Mo.
Sinclair Refining Co.	Kansas City, Mo.
Tide Water Oil Co.	New York
U. S. Graphite Co.	Saginaw, Mich.
Vacuum Oil Co.	Chicago
Tractor Radiators	
C. A. S. Engineering Co.	Detroit
McCord Mfg. Co.	Detroit
Modine Mfg. Co.	Racine, Wis.
Oakes Co.	Indianapolis, Ind.
Perfex Radiator Co.	Racine, Wis.
Miscellaneous Equipment	
American Manganese Steel Co., Steel Products	Chicago
Bosch Magneto Co., Magnetos.	New York
Byrne Kingston Co., Carburetors, etc.	Kokomo, Ind.
Champion Spark Plug Co., Spark Plugs.	Toledo, Ohio
Diamond Chain Co., Chains.	Indianapolis, Ind.
Double Seal Ring Co., Piston Rings.	Kansas City, Mo.
Eisemann Magneto Co., Magnetos.	Brooklyn, N. Y.
Fulton Co., Thermostatic Regulators.	Knoxville, Tenn.
K. W. Ignition Co., Ignition Systems.	Cleveland, Ohio
Indiana Silo Co., Tractor Tools.	Kansas City, Mo.
Link Belt Co., Belting.	Chicago
McQuay-Norris Mfg. Co., Piston Rings	St. Louis, Mo.
R. D. Nuttall Co., Tractor Gears.	Pittsburgh, Pa.
Remy Electric Co., Electric Starters.	Chicago
Splitdorf Electrical Co., Dixie Magnetos.	Chicago
Willard Storage Battery Co., Storage Batteries.	Cleveland, Ohio
Columbian Steel Tank Co.	Kansas City, Mo.
C. A. S. Engineering Co.	Detroit

Carnegie Steel Co.	Pittsburgh, Pa.
Norma Co. of America.	New York
Geuder, Paeschke & Frey Co.	Milwaukee, Wis.
H. R. Mosler Co.	Mount Vernon, N. Y.
Agrimotor Magazine.	Chicago
Automotive Export Corp.	New York
Clarke Publishing Co.	Madison, Wis.
Capper Publications.	Topeka, Kan.
Chilton Co.	Philadelphia, Pa.
Farm Implement News.	Chicago
Implement & Tractor Trade Journal.	Kansas City, Mo.
National Farm Power.	Chicago
Sweeney Automobile & Tractor School.	Kansas City, Mo.

## Distributors

The following Southwest distributors of tractors, tractor accessories and power-farming machinery will exhibit in conjunction with their respective manufacturers:

Acme Harvester Co.	Kansas City, Mo.
Advance-Rumely Thresher Co.	Kansas City, Mo.
Aultman-Taylor Machinery Co.	Kansas City, Mo.
Avery Co.	Kansas City, Mo.
B. F. Avery & Sons Plow Co.	Kansas City, Mo.
Bentley Sales Co.	Kansas City, Mo.
J. I. Case Plow Works.	Kansas City, Mo.
J. I. Case T. M. Co.	Kansas City, Mo.
John Deere Plow Co.	Kansas City, Mo.
H. A. Dougherty Motor Co.	Kansas City, Mo.
P. J. Downes Motor Co.	Kansas City, Mo.
Emerson-Brantingham Implement Co.	Kansas City, Mo.
Farm Tractor Sales Co.	Kansas City, Mo.
Kansas Moline Plow Co.	Kansas City, Mo.
Kaufman-Parrett Co.	Kansas City, Mo.
General Motors Co.	Kansas City, Mo.
Oliver Chilled Plow Co.	Kansas City, Mo.
G. T. O'Maley Tractor Sales Co.	Kansas City, Mo.
Parlin & Orendorff Plow Co.	Kansas City, Mo.
Rock Island Implement Co.	Kansas City, Mo.
Simplex Spreader Co.	Kansas City, Mo.
F. G. Stauder Mfg. Co.	Kansas City, Mo.

## Late Additions

Fafnir Bearing Co.	New Britain, Conn.
American Pulley Co.	Philadelphia, Pa.
Crew Levick Co.	Philadelphia, Pa.
Journal of Agriculture.	St. Louis, Mo.
Farm Machinery Farm Power	St. Louis, Mo.
Madison Kipp Lubricator Co.	Madison, Wis.
Universal Lug Co.	Cicero, Ill.
Baldwin Chain & Mfg. Co.	Worcester, Mass.
Beaver Motor Co.	Milwaukee, Wis.
Stowe Supply Co.	Kansas City, Mo.
Howard Motors Co.	Kansas City, Mo.
Wisconsin Farm Tractor Sales Co.	Madison, Wis.
Farm & Fireside.	New York
Joseph Dixon Crucible Co.	New York
W. W. Coates Co.	Kansas City, Mo.
Oklahoma Farmer-Stockman.	Oklahoma City, Okla.
Gill Mfg. Co.	Chicago
Acheson Oil-Dag.	Kansas City, Mo.
Merchant Evans Co.	Philadelphia, Pa.
Standard Steel Castings Co.	Clearing, Ill.
Anderson Forge & Machinery Co.	Detroit
Mechanical Belt Co.	St. Joseph, Mo.
Wood Brothers Thresher Co.	Des Moines, Iowa
American Fruit Grower.	Chicago
Moto-Meter Co.	New York
Foot Bros. Gear & Mch. Co.	Chicago
American Bronze Corp.	Berwyn, Pa.
Dorr Miller Differential Sales Co.	New York
Curtis Publishing Co.	Philadelphia, Pa.
Strite Tractor Co.	Minneapolis, Minn.
Hillard Clutch Co.	Elmira, N. Y.
Fedders Mfg. Co.	Buffalo, N. Y.
H. C. Doman Co.	Oshkosh, Wis.
Hathaway Motor Co.	Kansas City, Mo.
Holly Carburetor Co.	Detroit
Rally Automobile School.	Kansas City, Mo.
Morgan Corp.	Chicago
Ajax Auto & Aero Sheet Metal Co.	New York
Sweeney Automobile & Tractor School.	Kansas City, Mo.
Gallon Iron Works & Mfg. Co.	Gallon, Ohio
Shelby Truck & Tractor Co.	Shelby, Ohio
McCord & Co.	Chicago
Tractor & Trailer.	New York
Howard Motor Co.	Kansas City, Mo.
Tri-State Motor Co.	Kansas City, Mo.
Power Farming Press.	St. Joseph, Mo.
C. A. Kessler.	St. Joseph, Mo.
G. T. O'Maley.	Kansas City, Mo.
Towers & Sullivan.	Rome, Ga.
Illinois Form-A-Truck Co.	Chicago
Rhodes Implement Co.	Kansas City, Mo.
Society of Automotive Engineers.	New York
Bailor Plow Mfg. Co.	Atchison, Kan.
Mutual Oil Company.	Kansas City, Mo.
P. & O. Plow Co.	Kansas City, Mo.
Electric Storage Battery Co. of Philadelphia.	St. Louis, Mo.
Taylor Wharton Iron & Steel Co.	Chicago
Indian Refining Co.	Kansas City, Mo.
Scientific Farming.	Minneapolis, Minn.
Stromberg Motor Devices Co.	Chicago
Stover Mfg. Co.	Kansas City, Mo.
T. E. Bissell Co.	Lockport, N. Y.
Implement Age.	Springfield, Ohio
H. D. Lee Mercantile Co.	Kansas City, Mo.
United States Bureau of Labor.	Kansas City, Mo.
King Corn Silo Co.	Kansas City, Mo.
Rothacker Film Mfg. Co.	Chicago
Willis-Flack Mfg. Co.	Kansas City, Mo.
Simms Magneto Co.	East Orange, N. J.
Hide, Leather & Belting Co.	Indianapolis, Ind.
Plains Oil Co.	Kansas City, Mo.
Link Mfg. Co.	Kansas City, Mo.
Sparks-Withington Co.	Jackson, Mich.

# St. Louis Show Opens with Promise

## Sixty-Six Cars Are Exhibited— Dealers Will Hold Trade Meetings

**S**T. LOUIS, Feb. 17—The twelfth annual show opened in the Exhibit building to-night under auspicious circumstances and with a good attendance. Sixty-six makes of cars, with 264 models, are shown by forty-four St. Louis dealers. Fifty-four firms are exhibiting in the automotive equipment section.

The Exhibit building has been much improved since last year, when the partitions that were in use when the old Southern hotel was there were standing. This year these have been removed from the two floors used for the show, and on the second floor the old boards have been replaced by concrete. There is little of the hotel character left of the two floors. These changes made the decorations much more comprehensive. A creditable showing has been made in the effort to maintain the reputation St. Louis has had of "the best decorated show." The decorations this year are the purple and gold colors of the show and with colors of the U. S. A. and allies. The cars new to St. Louis are the Essex, the Owen-Magnetic and the Holmes.

Tuesday Edward S. Jordan of the Jordan Motor Car Co., and E. E. Peake of Kansas City will address a meeting of all the dealers in the city. Thursday F. W. A. Vesper of the N. A. D. A. and Robert E. Lee, manager of the show, will address a dinner of all accessory dealers.

The Sunday newspapers carried especially heavy advertising in their motor car sections. The one which usually carries the most of this advertising exceeded any previous record by almost 25 per cent.

The show committee consists of H. F. Fahrenkrog, chairman; Joseph A. Schlecht, ex-officio chairman; Phil H. Brockman, William L. Johnson; C. E. Lightfoot, truck representative; John F. Shuford, accessory representative, and Robert E. Lee, manager. The cars shown are:

Allen, Anderson, Apperson, Auburn, Biddle, Briscoe, Buick, Cadillac, Case, Chalmers, Chevrolet, Cole, Columbia, Comet, Crow-Elkhart, Daniels, Davis, Dixie Flyer, Dodge Brothers, Dorris, Dort, Elcar, Elgin, Essex, Ford, Franklin, Grant, Harroun, Haynes, Hudson, Hupmobile, Jordan, King, Kissel, Lexington, Liberty, Locomobile, Marmon, Maxwell, Mitchell, Moline-Knight, Moon, Nash, National, Oakland, Oldsmobile, Olympian, Overland, Owen-Magnetic, Packard, Paige, Paterson, Peerless, Pierce-Arrow, Premier, Reo, Saxon, Scripps-Booth, Stearns, Stephens, Studebaker, Stutz, Velle, Westcott, Willys-Knight, Winton.

### LOUISVILLE ELEVENTH ANNUAL

Louisville, Ky., Feb. 17—Special telegram—Under conditions rich with promise the eleventh annual exhibition of the Louisville Automobile Dealers' Association opened at 6 o'clock to-night with fifty exhibitors sharing the armory. The demand for space was so great many dealers were unable to get into the building with their exhibits. Thirty-three makes of cars are listed. One electric, sixteen trucks and four tractors and power equipment tractor attachments are displayed. Eighteen con-

cerns are included in the accessory department.

From a standpoint of attendance and sales the show is expected to shatter all previous records, for with the addition of 18,000 owners in Kentucky alone last year the interest in the exhibition has increased proportionately. It is predicted more cars will be sold during the next ten months, while the dealers believe this year will be the most prosperous in the history of the industry in this territory. Dealers, motorists and prospective owners of passenger cars, trucks and tractors are in attendance from all parts of Kentucky and southern Indiana.

### PHILADELPHIA SHOW DATES

Philadelphia, Pa., Feb. 15—The show sponsored by the Philadelphia Automobile Trade Association will be held in the Commercial Museum, March 8-15, to be followed by the exhibit of motor trucks under the auspices of the Motor Truck Association of Philadelphia in the same building March 17-22.

The show committee consists of A. E. Maltby, president of the Automobile Trade Association; Lee J. Eastman, Louis C. Block, John H. Fassitt, J. E. Gomery and the executive committee of the association.

### IOWA DEALERS TO MEET

Des Moines, Ia., Feb. 14—An all-day conference for motor car, truck and tractor dealers of Iowa is to be held in Des Moines Feb. 18, the second day of the Des Moines

show. The conference is called particularly to give attention to the legislative program which the motor industry of the state desires to foster during the present session of the Iowa legislature. Road laws, the sale of used cars and the bill affecting the manner of handling license plates are among the more important questions to be considered at the conference. Motor associations of the state are more active at the present time than for some years past. Among the most recently organized is one at Oskaloosa. Officers of the Motor Trades Bureau of the Des Moines Chamber of Commerce are assisting in the organization of bureaus in other cities of the state, and in the absence of a state association the Des Moines bureau is serving as a clearing house for the dealer interests in Iowa.

### GRAND RAPIDS TENTH ANNUAL

Grand Rapids, Mich., Feb. 17—Sixty-six exhibitors are taking part in the tenth annual show which opened here to-day under the auspices of the Grand Rapids Automobile Business Association. They are showing twenty-eight cars, fourteen trucks and twenty-four lines of accessories.

While the Essex is the only car making its formal debut to western Michigan, there is a brand new exhibit in the truck section. This is the  $\frac{3}{4}$ -ton Oldsmobile with cord tires all around. Continental is showing its adaptation of the class B engine in the 5-ton Acme. I. H. C. also has a new model, the Merchants' Express, a  $\frac{3}{4}$ -tonner with pneumatics.

### BRIDGETON TO HOLD SHOW

Bridgeton, N. J., Feb. 15—The fourth annual show of the Bridgeton Automobile Dealers' Association will be held April 5-12. This is the premier exhibit of South Jersey, and elaborate preparations are being made to have it even better this year. Music will be furnished by an orchestra,

# Des Moines Show Is Automotive Cars, Trucks, Tractors and Accessories

**D**ES MOINES, Iowa, Feb. 17—Special telegram—The tenth annual Des Moines show opened to-day at the local plant of the Ford Motor Co., which affords four times as much space as has been available in previous years, when the show has been held in the Coliseum. A great display of tractors and trucks is the big new feature of the show. Prosperous Iowa is flocking to the show and, as a result of last year's bumper crops, is better able than ever to buy cars. Sixty-four exhibitors hold space at the show.

More than 200 different models, representing forty-eight lines of cars, make up the greatest showing of passenger cars ever made in Iowa. There are thirty-five makes of trucks on display and eighteen makes of tractors.

Individual exhibit spaces are larger than

at previous shows, and each exhibitor has a better chance to show his cars. Each space covers 1250 sq. ft. Two complete floors of the building are taken up by the show, and three elevators afford constant communication.

There is only one aisle on each floor. A carload of Alabama smilax and 21,000 artificial apple blossoms have been used for the decorations of the show. The cost of staging the event was \$10,000.

One of the attractive features of the show is the showing of one complete Liberty engine, which is displayed by Packard.

The showing of cars is the gayest as well as the greatest ever made in this state. It is attracting dealers from all sections of the state and is attracting men who are taking up the sale and distribution of tractors and trucks in the smaller communities. Dean Schooler and C. G. Van Vliet are the show managers, as they have been ever since the first Des Moines show. Harter B. Hull is in charge of the tractor and truck departments.

Minneapolis Show Report

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and dancing will be a feature every evening from 9:30 to 12.

Bridgeton is in the heart of the South Jersey agricultural district, being known as the garden spot of the garden state, and the rural trade in motor cars and accessories is very large. Joseph W. Acton is president of the association, and Oliver P. Riley is secretary.

#### HARTFORD READY FOR SHOW

Hartford, Conn., Feb. 14—All space is sold for the twelfth annual show of the Hartford Automobile Dealers' Association, which opens at the armory Feb. 22. Passenger cars, trucks, trailers and farm implements will be shown on one floor. The show is to be held under the auspices of the First Regiment, Connecticut State Guard.

#### TAX APPROVED BY SENATE

Washington, Feb. 14—The new Revenue Bill carrying among its provisions a tax of 5 per cent on passenger cars and parts and 3 per cent on trucks and parts, was passed by the Senate yesterday. It now goes to the Vice-President for approval. The bill contains the provisions relative to automotive products just as they were published in *MOTOR AGE* last week.

#### TO DISCUSS TRACTORS

Kansas City, Mo., Feb. 15—The Society of Automotive Engineers will hold a tractor meeting and dinner here Feb. 27, during the National Tractor Show. At the professional session in the afternoon the papers to be presented include "Tractor Testing" by J. B. Davidson of the University of California, who was in charge of tests at Salina last summer. This session will be held in the auditorium of the Sweeney Automobile School opposite Union Station. The dinner will be at 7 o'clock that evening at the Hotel Baltimore.

#### ENTER THE CLEVELAND CAR

Cleveland, Ohio, Feb. 17—Officials of the Chandler Motor Car Co. are interested in an organization to build a low-priced car. The new concern will be known as the Cleveland Automobile Co., and the car will be known as the Cleveland car. The company has been incorporated under the laws of Delaware and has an authorized capital stock of \$1,400,000. F. B. Chandler, president, and Samuel Regar, treasurer of Chandler, and Hornblower & Weeks, New York branch, are the leaders of the organization of the new concern, which will be identified very closely in personnel with the Chandler company.

The car will be manufactured in an entirely separate factory, and it is expected that building will commence within ten days on the new plant. It is proposed to be in production during the early part of the coming summer. Officials of the Cleveland company state they have not been able to determine exactly on the price at which the new car will sell, this depending upon factory costs after getting into production. It is stated, however, that the price will be materially lower than the Chandler. It is very probable the new product will be marketed largely through Chandler distributors.

## Nation Alive to Worth of Good Roads

### States Allot Millions for Highways —\$200,000,000 Available in 1919

WASHINGTON, Feb. 14—A nation-wide ambition for a complete network of good roads and highways through the country is evidenced by reports received here of state appropriations for highways and by the popular approval that has been expressed in favor of the national highway bills now before Congress. It appears that as a result of the work of the various associations, the expression of President Wilson in favor of good roads and the activities of the Highways Transport Committee during the war, the plan for good roads has suddenly become crystallized in the minds of the entire country. Reports received here indicate that all the states are considering road appropriations and several have already passed the necessary bills for funds covering the next few years.

Minnesota has appropriated \$100,000,000; South Carolina, \$40,000,000; Illinois, \$60,000,000; Pennsylvania, \$50,000,000; Georgia, \$40,000,000; Colorado, \$20,000,000, and Alabama, \$10,000,000, to be used in conjunction with the funds appropriated by the 1917 Federal road act for the development of the highways.

It is estimated that between \$200,000,000 and \$300,000,000 will be available for highways during 1919. The Federal road act appropriated \$5,000,000 in 1916-17, \$10,000,000 in 1917-18, \$15,000,000 in 1918-19, total of \$30,000,000, of which \$1,487,336 has been actually paid out by the Treasury and a total of \$10,303,379 has been set aside.

To date 827 projects for road construction have been submitted, of which 760 were approved at an expenditure of \$21,112,795.30 of Federal funds and \$35,069,051.42 of state funds, a total of \$56,171,846.72. These funds are for projects covering 7869 miles. The money actually expended to date was for ten projects of 44 miles, which have been completed. The reason for the delay in completion of highways and for the small amount actually expended is found in the war, during which it was impossible to use freight cars or secure materials for highway construction.

The new Bankhead bill, which most probably will be passed by Congress and which already has been passed by the Senate, provides for \$200,000,000, with \$50,000,000 available at once for 1918-19, \$75,000,000 in 1919-20 and \$75,000,000 in 1920-21. This bill, which has been described in these columns before, is practically an amendment and continuation of the original Federal road act of 1916. The states must provide appropriations on a dollar-for-dollar basis to secure their share of the national funds.

In consequence of the Bankhead bill and funds already available, there will be at least \$200,000,000 to be expended in 1919 if the states comply immediately with the conditions of the Federal road act and provide dollar-for-dollar state funds. Of the \$30,000,000 originally appropriated by the Federal road act, \$20,000,000 are still available, and in addition \$35,000,000 appro-

riated by states are still available, making a total of \$65,000,000. Fifty million dollars are appropriated by the Bankhead bill for 1919, and an additional \$50,000,000 will be voted by the various states, making a total of \$100,000,000. Consequently, \$165,000,000 will be available in 1919, and as the states usually exceed the dollar-for-dollar basis by 50 per cent, it is probable the total sum available will be over \$200,000,000.

The National Highways Commission bill which was the result of the highways meeting in Chicago is to be rewritten to meet the legal requirements. This bill may be presented at this session of Congress or may be held over until the next session, depending upon the opportunities presented. It is quite certain that, even though presented at this session, it will not be considered until some future date.

#### \$100,000,000 FOR ROADS

Minneapolis, Minn., Feb. 14—The House of Representatives to-day, by a vote of 110 to 70, passed the \$100,000,000 amendment to the state constitution. The senate passed the bill yesterday by a vote of 58 to 3. The bill as passed by the house received some unimportant amendments which it is thought the senate will concur in without delay. In this case the amendment will be referred to the citizens of the state and, if approved, the first \$10,000,000 annual appropriation under the amendment will be available in less than two years.

The Minnesota amendment contemplates one of the most ambitious road-building programs contemplated anywhere in the country. The proposed system of truck roads is 60,000 miles in length and reaches every county. The plan is to issue bonds not to exceed \$10,000,000 annually until the whole amount carried by the bill shall be issued.

#### PLANS FOR SANTA MONICA

Los Angeles, Cal., Feb. 14—The first after-the-war show was held here, the first speedway race event, and now it is the Santa Monica March 15, the initial event of the kind for the year. The race is the second event on the program of the Motor Car Dealers' Association's campaign for stimulating interest in motor cars, the show having been the first. It will be conducted by a committee appointed by the association. A. M. Young is the chairman.

The management said to-day that at least fifteen of the fastest cars in the country would appear. Durant already has entered and the Packard company has notified its local representative a racing car of its make will be sent here with de Palma driving. For the mutual interest of all concerned it is hoped Earl Cooper will be reinstated by the A. A. A. in time to permit his appearance. Cooper always is a favorite here. A purse approximating \$10,000 will be split four ways.



# EDITORIAL



## What is the Speed Limit?

**H**AVE we reached the limit of speed for motor cars? Ralph de Palma thinks the speed possibilities of wheel vehicles are not much over 150 m.p.h. as at present constructed. Inasmuch as he has traveled faster than any other man ever traveled on wheels and inasmuch as he is not only a driver but a speed engineer as well, his opinions are worth consideration. He does not think that speed and power possibilities of the engines themselves are the determining factors but that other portions of the car are the parts that will require redesigning.

**O**NE of the chief difficulties is that of keeping the car on the ground. It is necessary to have a pan, or bottom, underneath the chassis, and at such speed as 150 m.p.h. this pan becomes virtually an airplane supporting surface and the entire car frequently is lifted off the ground by the compression of the air underneath. To overcome this handicap, perfect balance of the car must be maintained by the proper distribution of weight so that after a jump it will strike the earth on all four wheels. Older readers will remember that years ago the Stanley steamer, a car which held the records for a time, met with an accident on account of the airplaning tendency.

**T**HE effects of centrifugal force on the wheels and tires also are limiting factors. At these high speeds centrifugal force may be so great the wheels actually fly apart and the tires dis-

integrate. In addition there is the heating effect on the tires due to friction. In spite of the remarkable development made by tire manufacturers to meet these requirements, a set of tires on such a car as the one with which he set the record last week has an average life of not much more than 10 miles.

**D**E PALMA thinks 3 miles a minute, or 180 m.p.h. entirely feasible with a 400-hp. Liberty engine, so far as power to drive a car over the course is concerned. But before such an achievement is possible, he says, there must be new developments in wheels and tires so that the car will hold together at this speed. The airplaning effect he hopes to overcome by special design of rear fenders so they will exert more force in a downward direction.

**D**E PALMA'S recent exploit is welcome not because it adds to his laurels and those of the Packard company and not alone because it gives to America the palm of speed. It is welcome because it will reawaken an interest in straightaway speed trials, which has been dormant for many years. It is not expected that this challenge to the world of speed will not be taken up by other drivers and other car manufacturers. We will be surprised if Fiat does not make a try before a great while with one of the big racers it had in development before Italy got into war.

## Farm Tractors in 1919

**E**LSEWHERE in this issue estimates as to the total number of tractors in the hands of United States farmers are given. It is estimated that there are in use to-day approximately 140,000 farm tractors. This is an insignificant total as compared to the number of live prospects for farm tractors, but it is evident that the farmer is awake to the possibilities of power farming and that the industry, just getting into its stride, has a great future before it. Just how soon the millenium, when every farmer shall own one tractor at least, will come, if ever, need not worry any maker or dealer, especially as long as tractor production is where it is. But that the coming year is going to see a big advance in tractor designs and sales is certain, and the motor car dealer who holds on to his punch in selling the tractor as he has sold the passenger car in past years is going to be in at the brush.

**T**HIS week saw a big happening at Minneapolis. And the next will see a bigger. Minneapolis, moreover, is more than a tractor show. It is a motor car show, a truck show, an industrial show and all combined in one. Attendance the first day broke the record of last year even.

**T**HE visitor to Minneapolis and Kansas City this year will find an array of tractors whose makers made for themselves the admirable record of 100,000 tractors during the war conditions of 1918. He will find an array of tractors whose makers have used the comparatively quiet industrial period of war times to improve his models. He will find competent and dependable tractors, a development of the last year or so. They are tractors which will be easier to operate and, which is most vital to the dealer, quicker to sell more because of that ease.

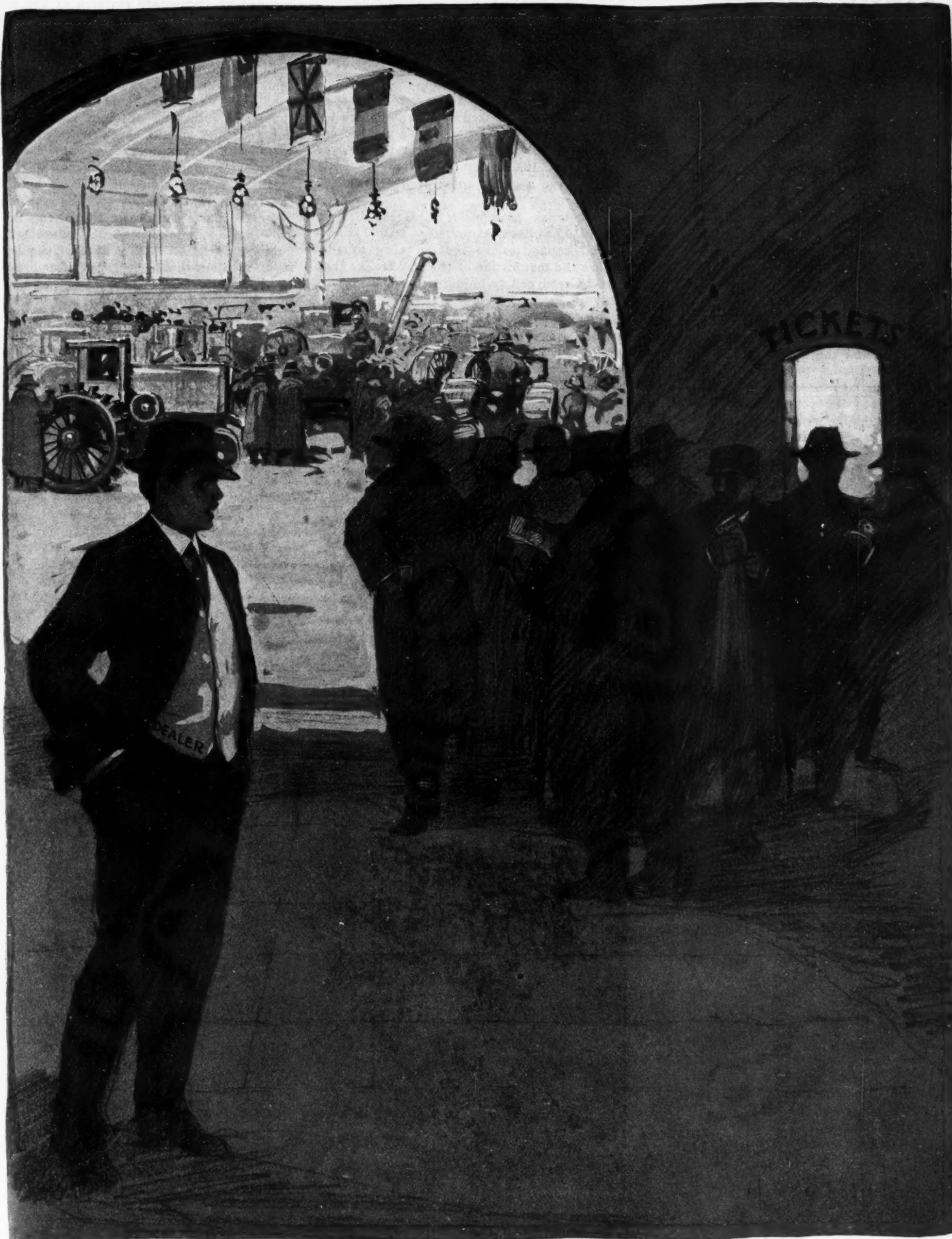
## Progress in Car Design

**T**HE "one-hoss shay" idea seems to have been impressed upon the minds of the designers in that they are getting more out of the material. For example: the construction of the frame from a deep channel section and riveting directly to this the runningboards does away with the apron and the runningboard hangers and allows the runningboard to give transverse stiffness to the frame. This is being incorporated into the design of several cars this year. There have been no pronounced changes in the design of engines. The ratio of bore to stroke is decreasing slightly, which gives a lighter engine, lighter reciprocating parts and a quicker return of the piston. This is desirable, because the heat of compression does not waste itself to the cylinder walls which would leave a cooler mixture for the spark to ignite.

**I**T looks as though the gearset is here to stay in more or less the same shape as it now stands. True, we have quieter gears, better shifting mechanism, better bearing layouts than in former years, but when all has been said and done, we still have to shift gears as before. We may expect to see in the near future gearsets incorporating all-in-mesh type of gears, wherein shifting becomes a simple matter with absence of clashing and damage to teeth. As long as we must have gears it is desirable to strive for something to remove the shifting bugbear.

**T**HE question of cooling system control is getting more and more attention, for this is closely allied to heating the intake gases. The radiator shutter and thermostatic control is a step in the right direction.

"Subject to Change Without Notice"



Dealer—I decided to stop handling tractors but I've changed my mind—I think I'll stick

# Truck Makers Consider Their Future

## Disposal of War Vehicles—Registration by Speed and Weight—Export Trade

NEW YORK, Feb. 14—The truck convention held by the National Automobile Chamber of Commerce here this week was one of the best in some time. More than seventy-five truck makers were represented, and a wide range of subjects was considered. Col. Fred Glover intimated that there will be very few surplus war trucks and that most of our war trucks in Europe will be disposed of on the other side of the Atlantic, while E. J. Mehren, representative of the Highways Industries Association, favored a Federal system of highways to supplement state systems and an educational campaign on highway improvement and the better use of highways.

S. M. Williams, president of the Highways Industries' Association, brought out the fact that the postoffice bill passed by the Senate last week provides that any surplus military trucks be turned over to the states for road-building, the states to pay for them in the same ratio as they share in the construction of Federal Aid highways. Many truck makers objected on the ground that such would cut off a possible market for new trucks. Colonel Glover stated that the motor truck industry could not expect to get back on a peace basis without some readjustment to make up for the many military trucks sold during the war.

### Registering Trucks

A new method of state registration of motor trucks based on speed and weight was advocated by George H. Graham, chairman of the Motor Truck Committee of the N. A. C. C. and presiding officer at the convention. There should be some fundamental system of registration and the two cardinal principles in such a system are speed and weight. The suggested method of determining trucks license fees based on speed and weight would eliminate the present discrepancies which vary from \$5 to \$125 for a truck of the same speed and capacity in various states. Connecticut has the \$125 fee for a 5-ton truck and Massachusetts has \$25 for a similar truck. States farther west have a \$5 fee for the same capacity vehicle. No action of the convention was taken on the suggestion.

The possibility of truck export trade with Europe, analyzed by David Beecroft, directing editor of the *Class Journal Co.*, who recently returned from a three-month investigation of conditions in Europe, showed prospects not specially bright, due to the large war production of England, Italy and France and the number of new and used war trucks that will be turned back into industry as soon as peace is finally settled.

British manufacturers are much perplexed over this situation. To-day there is no such thing as exporting trucks to Great Britain because the order of total restriction against imports is in force and is likely to remain in force for some time to come.

There are in England 20,000 new war trucks that can be turned into the channels of industry. In addition there are avail-

able nearly 50,000 used war trucks, most of which will be repaired or rebuilt before being put into industry. Added to this are 10,000 ambulances not needed in the war work and 12,000 light delivery vehicles, which give a grand total of nearly 90,000 vehicles.

The truck production of Great Britain for 1919 has been estimated at 20,000 trucks of all capacities, so that in view of this figure the magnitude of the war trucks that can be returned to industry becomes apparent.

The production of British truck companies varies from the largest factory with a capacity of 125 trucks per week to others having a capacity of but a few. There are, among the leading makers, two with a capacity of 25 per week each, and others with capacities of 18, seven, six, five and four per week.

Italy had a very large production of trucks during the war, Fiat alone selling upward of 50,000 to the Allies. Fiat's maximum production reached 170 a day and for months its production approached seventy-five a day. In Italy such other firms as Spa and Lancia have been building trucks in quantities during the war. France, England and America purchased large quantities of Fiat trucks.

Entire elimination of the standard warranty covering material and workmanship in trucks was recommended by E. J. Herbig, sales manager of the Service Motor Truck Co. The warranty was necessary in the early days of the industry but not today with the developed trucks. To-day the standard warranty is really an indication that something is going to happen to the truck.

This view was concurred in by David S. Ludlum, president of the Autocar Co. It

is not expected that any such radical action will be taken, but Mr. Herbig recommended an immediate revision of the warranty in order to make it more considerate of the owner and yet not work any sacrifice on the maker.

In handling spare parts Mr. Herbig had some suggestions to offer the truck maker, such as: The dealer should have the opportunity of returning obsolete parts within one year and should be paid the price for them that he originally paid the factory. The dealer should be required to carry a stock of spares sufficient to take care of the trucks in the territory. In returning defective parts the dealer should tag them showing the name of the truck owner, serial number of the truck and date of the fracture. Dealers should be given discounts on spares in accordance as they carry adequate supplies for the trucks in use. There should be a better standardization of the names of truck parts so as to avoid confusion that follows where dealers use different names for the same parts.

That truck manufacturers have never given sufficient consideration to standardizing the position and manipulation of spark, throttle, gearshift and emergency brake levers is the opinion of David C. Fenner of the International Motor Co.

A standard gate or location of the gearshift positions in relation to the driver's seat is highly important. If the S. A. E. standards which already apply to these features are not commercial, manufacturers should apply for a revision. If, on the other hand, these are among the details of motor truck design which are quite likely to be changed by further development, it would not seem wise to attempt their standardization at present.

### TO BUILD NEW TRUCK

Newark, Ohio, Feb. 14—The American Motor Truck Co., a new concern, will place a new truck on the market within sixty days. The new machine will be made in two sizes, a 1½-ton and a 2-ton. Later a 3½- and a 5-ton truck will be produced but not before the first of next year. The



Seaplane built by Capt. Hugo Sunstedt, the Swedish aviator, with which he hopes to cross the ocean from Bayonne, N. J., in 22 hr. Its upper wings are 100 ft. and it weighs 10,000 lb., carries four passengers and two tons of gasoline, is equipped with two six-cylinder Hall-Scott engines and has a speed of 80 m. p. h.

company will produce 300 trucks this year, the majority of which have already been sold.

About a year ago this company purchased the assets of the Blair Motor Truck Co., but it will not make the truck manufactured by Blair. Since incorporation the American Motor Truck Co. has been running 20 hr. daily on two-man tanks for the Government. This contract was recently canceled, and the company is now busy tearing out Government machinery and equipping the plant throughout for truck work.

The officers of the new concern are: President, J. D. Potter; vice-president and production manager, E. B. Alspach; secretary and treasurer, H. S. McCoy; chief engineer, C. H. Doty; superintendent, H. E. Cavendish.

#### NEW CONTROL FOR HAMMERED

Baltimore, Md., Feb. 15—The Bartlett Hayward Co. of this city has bought the entire capital stock of the Hammered Piston Ring Co. of America, whose plant is located in Newark, N. J. The purchaser is a concern which manufactured munitions on a large scale and has almost unlimited capacity for the manufacture of piston rings. It contemplates keeping the Newark plant in operation and handling increases in business at one of the Baltimore plants. Active management will remain in the hands of C. F. Hockley, vice-president and general manager, with headquarters at Newark.

#### COMMERCE TRUCK BACK

Detroit, Mich., Feb. 14—The Commerce Truck Co. is winding up its war contract work and is now running approximately 50 per cent on commercial production. Uncompleted Government contracts call for 300 war trucks, but these will be completed within thirty days. This company is now running fifteen commercial trucks daily. Business prospects are exceptionally bright, and at least 5000 machines will be made this year.

#### AJAX PROFITS LESS

New York, Feb. 15—The Ajax Rubber Co., Inc., showed an increase in its income for the year of \$960,075 over last year but a decrease of \$266,225 in its profits after the necessary deductions for taxes, dividends, etc., were made.

F. E. Dayton, formerly secretary, has been elected vice-president. W. J. Jackson succeeds Mr. Dayton as secretary. Otherwise there was no change in the officers.

#### AMAZON INCREASED BUSINESS

Akron, Ohio, Feb. 14—The Amazon Rubber Co. did a business during 1918 that showed an increase of 85 per cent over 1917. An extra dividend of 12½ per cent has been declared, payable in common stock. Officers re-elected for the year are: President, Albert Kroehle; vice-president, J. A. Burger; treasurer and general manager, L. J. Schott; secretary and general superintendent, L. S. Smith.

## 100,000 War Trucks and Cars for U. S.

### Total Probable Production for Military Use in 1919 Will Include 28,694

WASHINGTON, Feb. 14—In all 106,930 trucks and passenger cars were completed for the United States army during 1918, according to a report issued by the War Department. Of this number 89,277 were trucks, ranging from ½- to 5-ton, and 17,653 were passenger cars. Total probable production for military use for 1919 will include 28,694 trucks and passenger cars, of which 28,679 will be trucks and fifteen passenger cars.

Following is the total production for 1918 and the probable production for 1919 in sizes:

	1918	1919
½-ton trucks .....	3,454	....
¾-ton trucks .....	7,260	....
¾-1-ton trucks .....	2,474	....
1-ton trucks .....	16,363	6,805
1½-ton trucks .....	3,095	2,268
1½- to 2-ton trucks.....	8,977	1,385
2-ton trucks .....	14,415	3,369
3-ton trucks .....	28,073	12,627
3½-ton trucks .....	672	961
4-ton trucks .....	1,888	362
5-ton trucks .....	2,465	468
5½-ton trucks .....	3,141	434
Passenger cars .....	17,653	15
Total .....	106,930	28,694

#### Automotive Instruction

WASHINGTON, Feb. 14—Information recently released by the War Department in connection with the publishing of war instruction books on all types of Army motor vehicles reveals the magnitude of the task of training enough men to operate and maintain the motor equipment necessary to carry on the war. It required twenty-nine different books comprising a total of more than 5000 pages of instruction matter to illustrate and describe the Army ordnance trucks, tractors and tanks. To design and produce these books was the war task assigned to Capt. Lucius French, who prior to the war was advertising manager of the National Motor Car & Vehicle Corp.

These twenty-nine books were used in

this country and in France to train the personnel necessary to operate and keep in repair the three "Ts"—trucks, tractors and tanks.

The twenty-nine books contained a total of 5587 pages with 2134 illustrations. The average size of each book is 192 pages. The books were produced at an average of five books a month.

Associated with Captain French on this work were four of the countries' foremost technical editors on motor car construction, Darwin S. Hatch, managing editor of MOTOR AGE; J. Edward Schipper, technical editor of Automotive Industries; H. A. Tarantous, technical editor of Motor; and Chester S. Rieker of Indianapolis, technical editor of Automobile Trade Journal. The services of these editors were loaned to the Government by the publishers, and they served as a committee under Captain French to produce all Ordnance Department instruction matter on motor vehicles.

Captain French entered an officers' training school at the Rock Island Arsenal and was commissioned a first lieutenant in December, 1917. Because of his special training in connection with the issuing of motor car descriptive and instructive matter, he was selected to head the unit to issue all ordnance motor equipment books. Three cablegrams from headquarters of the A. E. F. over the signature of General Pershing made complimentary reference to these special instruction books and urged the expansion of that type of work.

#### GROWTH OF JORDAN SALES

Cleveland, Ohio, Feb. 15—In declaring a dividend of \$3.50 a share payable to stockholders of record Jan. 31 it is revealed that the capital of the Jordan Motor Car Co. has turned practically fifteen times since the war began. The sales and production record during the war is considered very unusual in view of the obstacles encountered by all motor car makers. In spite of advancing prices the total production for 1918 was only about 200 cars less than in 1917. The officers for the coming year are: President, Edward S. Jordan; vice-president, T. E. Berton; secretary and treasurer, Paul Zens.

#### SALES MANAGER FOR NELSON

Saginaw, Mich., Feb. 15—Glenn Hiller, formerly with the Seemann Peters office furniture company, has been made advertising and general sales manager of the Nelson Motor Truck Co., maker of the Jumbo truck. C. H. Tibbitts has been appointed first assistant sales manager.

#### SAYERS ADDS SEDAN

Cincinnati, Ohio, Feb. 15—The Sayers & Scovill Co. has added a new light five-passenger sedan. This will be a four-door job and will be furnished on the same chassis as the Sayers six five-passenger touring car.

#### INTRODUCING

Bill Strong—an unusually successful small-town dealer and garageman who next week makes his debut in MOTOR AGE. Every week or so our new friend will hold forth on topics of interest to the dealer and the man in the garage or repair business.

"The trouble with the average garageman or repairman is that he does not talk enough." With this rather upsetting statement, Bill Strong, of Liveburg, next week shows how he turns a disgruntled patron into a booster.

Selling the Owner on the Cash System, Plugging the Leaks in Gasoline Sales and How to Eliminate Tipping are some of the angles of the business that Bill Strong discourses on.

PILL STRONG—Beginning Feb. 27.

# De Palma Smashes World's Records

## Airplane-Engined Packard Sets New Speed Pace at Daytona

### OLD RECORDS

Miles	Driver	Car	Date	Place	Time	M.P.H.
1	Burman	Blitzen Benz	April 23, 1911	Daytona	:25.40	141.73
†1	.....	.....	.....	.....	.....	.....
*1	Duray	Fiat	1913	Ostend, Belgium	:25.09	142.9
2	Burman	Blitzen Benz	April 23, 1911	Daytona	:51.28	134.9
3	.....	.....	.....	.....	.....	.....
4	.....	.....	.....	.....	.....	.....
5	Hemery	Darracq	Jan. 24, 1906	Daytona	2:34	116.93
10	DePalma	Packard	Aug. 17, 1918	Sheepshead Bay	5:23.8	111.3
15	.....	.....	.....	.....	.....	.....
20	Burman	Buick Bug	March 30, 1911	Jacksonville	13:11.92	91.02

\* Kilometer record but not official as time was not made in both directions.  
† Standing start.

### NEW RECORDS

Date	Time	M.P.H.
Feb. 12	:24.02	149.72
Feb. 17	:38.83	92.74
Feb. 12	:14.98	150.
Feb. 16	:49.54	145.27
Feb. 16	1:15.04	145.20
Feb. 16	1:39.77	144.5
Feb. 16	2:04.58	144.3
Feb. 16	4:09.31	144.29
Feb. 17	6:48.75	132.1
Feb. 17	8:54.20	134.85

DAYTONA, Fla., Feb. 17.—America now holds the distinction of having produced the fastest thing on wheels. This was proved this week when Ralph de Palma in his speed trials broke all world's motor records up to 20 miles in an airplane-engined Packard.

Last Wednesday de Palma broke the world's speed record for the mile in 24.2 sec., or 149.87 m.p.h. This eclipsed the previous world's record of 25.40 sec. set up by the late Bob Burman in the Blitzen Benz on the same course, April 25, 1911. At the same time he established a new kilometer record of 15.86 sec., as against Burman's figure of 15.88 for the distance.

Since he has added to the laurels he won Wednesday by setting up new marks for 2, 3, 4, 5, 10 and 20 miles. Most of the marks against which de Palma rode were held by foreign cars, and many of them were of long standing, so there is particular

joy for him in supplanting them with records made by a car American in design and construction.

De Palma's exploit in setting up a new world's record for the mile and kilometer settles the uncertainty which has existed previously, as to the real holder of the speed crown. In 1913 Arthur Duray covered a kilometer in a Fiat at 142.9 m.p.h., but Duray's performance was not made an official record because he did not comply with the European rule, which provides that on a straightaway course trials must be made in both directions and the average time taken. This mark, whether it be considered official or not, now is definitely in the discard because de Palma did the kilometer, approximately  $\frac{5}{8}$  of a mile, at an even 150 m.p.h.

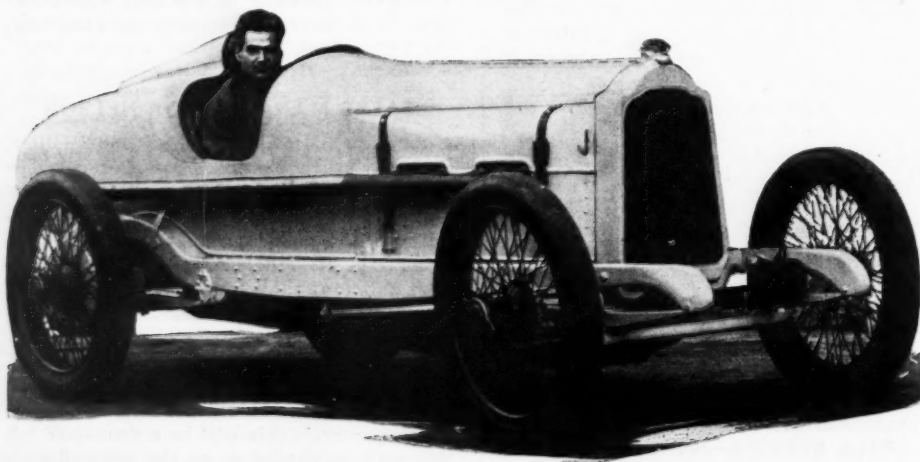
The kilometer, the mile, the 2-mile, 3-mile and 4-mile records which de Palma broke all were set by Burman in the Blitzen

Benz, a German car, eight years ago. In his flight the Italian eclipsed the record held by the Durracq and made by Hemery thirteen years ago, knocking  $\frac{1}{2}$  min. off the French car's time. At the 10 miles de Palma had bettered by a minute the record set by Bruce Brown nine years ago in the Blitzen Benz. To-day he capped the climax by trimming over 4 min. off the world's 20-mile record made at Jacksonville, Fla., by Burman in the Buick Bug, eight years ago.

De Palma's successes last summer was with the Packard 299-cu. in. aircraft engine were significant. He smashed track records with such ease that it was apparent he could have practically any record he set out to capture for cars in the 300-cu. in. class. With the idea of bettering the formidable Burman mark de Palma took the 905-cu. in. aircraft engine which, while having three times the piston displacement of the 299, is still smaller than Burman's Benz by more than 400 cu. in. The displacement of the German engine is 1312 cu. in., but it does not show as great power.

The 905-cu. in. engine which de Palma is using at Daytona is a complete aviation engine with the propeller removed and an electric starter installed because no one man could crank it by hand. It was built by Packard engineers late in 1916 and is the second of an experimental series of engines which had an important influence over the design of the Liberty engine. It has about 260 hp., a piston displacement of 904.8 cu. in. and is the one with which William Rader broke all former speedway records from  $\frac{1}{4}$  to 10 m.p.h. on the Sheepshead Bay track.

Aviation experience had much to do with the design of the body for de Palma's record breaker. The same methods of



De Palma in the Packard which is fastest thing on wheels

streamlining employed in an airplane fuselage were used insofar as possible to eliminate vacuum drag, for instance, the resistance of the front axle at top speed was reduced nearly 100 lb. by applying the streamline principles. The car with driver weighs 3400 lb.

#### FIRST WOLVERINE TRACTOR

Saginaw, Mich., Feb. 14—The Wolverine Tractor Co. a newly-organized company, has built its first tractor and within thirty days quantity production will start. During 1919 1000 machines will be built. Within sixty days seventy-five men are to be working in the plant, which will occupy about half the old Bransfield-Billings factory. W. E. Wood of Detroit is president and W. H. Wagenhals, superintendent.

#### ANTERIOR CARBURETER DISCUSSED

Chicago, Feb. 15—A carbureter which takes its fuel from a rear tank without needing a pressure feed or vacuum system was described to the Midwest section of the Society of Automotive Engineers at its regular February meeting last night.

The chief paper was entitled, "The Anterior Carbureter," and was presented by Edward A. Huene, Los Angeles, Cal., who has experimented with the type of carbureters having an anterior throttle. In addition to its self-feeding feature, it has another item of simplicity, in that there is no float mechanism. The unusual features of the device brought forth considerable discussion from Stromberg and Rayfield engineers.

#### MOON PRESIDENT DIES

St. Louis, Mo., Feb. 14—Joseph W. Wood, president of the Moon Motor Car Co., died Tuesday night after a year's illness. He was born in Brown County, Ohio, sixty-six years ago. In 1882 he came to St. Louis, and with his brother, J. C. Moon, organized the Moon Bros. Carriage Co. Ten years later he organized the Joseph C. Moon Buggy Co., of which he was head. At the time of his death he was also vice-president of the Scheler Implement Co., Moline, Ill.

There will be no change in the affairs of the Moon company as Mr. Moon practically retired a year ago. The business

will be continued under the direction of Stewart McDonald, vice-president and general manager.

#### THEY CALL IT "RICK"

Columbus, Ohio, Feb. 15—Will somebody please name a perfume after Rick? For that's all that is lacking. You'd never think a racing driver would see a song written with him as the piece de resistance, now, would you? It has been done. Nor would you think a tractor salesman would write a song, would you? Well, that's done, too. Columbus, the home of Capt. Edward V. Rickenbacher, is giving a banquet in honor of America's ace of aces Monday night under the auspices of the Columbus Automobile Club. On the menu will appear a new song, "Rick, He Made the Huns Sick." Dick B. Bruun, a salesman for E. H. Bryant, Fordson distributor, is the author. Mr. Bruun used to be a composer of popular songs in Omaha but it was thought that the civilizing effect of automotive life had restrained the wild muse. Not so. The return of Captain Rick was too much, and Bruun burst forth into song.

## Army Bill Abolishes Motor Transport Corps Scatters Control of Vehicles Among Divisions

WASHINGTON, Feb. 14—The Army appropriation bill providing for 28,579 officers and 509,909 enlisted men and appropriating \$1,117,289,488.56 orders the repeal of the Overman act under which the Motor Transport Corps, Tank Corps and aviation corps were created for the emergency. Its provisions abolished the Motor Transport Corps and Tank Corps completely. The aviation department, both military and production, are recommended for continuation.

The bill provides for the purchase, operation and maintenance of motor trucks and other motor vehicles by each individual Army corps, such as the engineers, Quartermaster, Ordnance and Signal Corps, and thereby reverts back to that condition which existed prior to the war, when the motor transport was not pooled and when each division purchased different types and sizes of vehicles, creating waste, confusion, extravagance and inefficiency, which finally resulted in the creation of a Motor Transport Corps to pool motor vehicles under one body.

#### Opinion of Officials

Hearings of the House Military Affairs Committee which prompted this act have not been made public, and consequently the causes are not available for publication at present. It is thought in official circles here that either a vital omission was made accidentally on the part of the House Military Affairs Committee in thus scattering the purchase, operation and maintenance of motor vehicles throughout the Army or that possibly some influence has brought about this arrangement, probably by suggestion to the committee. It is known that none of the Army officers connected with the Motor Transport Corps testified with regard to the functions or importance of that corps to the committee. Amazement

at the provisions of the bill is displayed, particularly so because of the proof that motor transport must be pooled in this country from the experiences of France and Great Britain.

The bill, as it now stands, allowing each corps to operate and maintain its own trucks and other vehicles, means a complete cessation of the standardization plan and a renewal of the original system whereby hundreds of types of trucks were operated, necessitating the maintenance of great stores of parts for maintenance and repair.

One of the first lessons that came out of the war was that idle trucks were a frequent result of the operation of trucks under different corps. There was no correlation of work. One corps cannot use the trucks of another corps.

An effort will be made, it is understood here, to present this matter properly before Congress and urge an amendment which will make an appropriation for the Motor Transport Corps and take the purchase, operation and maintenance of trucks from the other divisions, or pool them under the motor division. That either this step or the pooling of all the motor vehicles under the Quartermaster Department in one division is vitally important to the Army is the statement made by many Army officers.

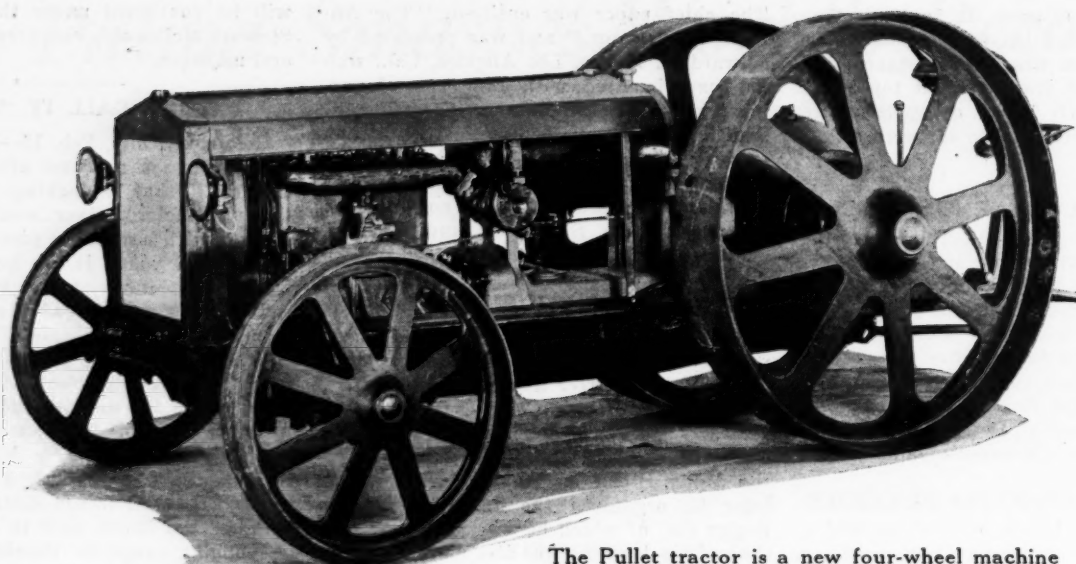
The Army bill provides \$4,000,000 for the Signal Corps, \$10,000,000 for military air service, \$449,000,000 for the Quartermaster Department and \$3,000,000 for the Ordnance Department and specifically states that these funds, in addition to the purchase of other supplies for each of these departments, are also for the "purchase, hire, operation, maintenance and repair of motor propelled vehicles" by each of these respective departments. It also provides \$500,000 for the Ordnance Department for the purchase, manufacture and main-

tenance of armored motor cars. The sums appropriated are to remain available until Dec. 31, 1920.

The legislative section of the bill provides for the repeal of the Overman act, an "act to authorize the President to coordinate and consolidate executive bureaus, agencies and offices in the interest of economy and more efficient concentration of the Government." It authorizes the President to continue any such corps as he shall deem necessary, but since motor vehicle appropriations have been made directly to each specific Army corps, completely ignoring the Motor Transport Corps, that division could be continued only as a superfluous, unnecessary body without functions. Furthermore, the statutes specifically state that the head of one department cannot disburse funds which have been appropriated in the name of another department, and even though the President might see fit to continue the Motor Transport Corps as such, it would be left without functions or funds.

#### Amendment to Bill

One amendment which has been suggested and may be proposed for the Army bill provides that all motor cars, trucks, trailers, motorcycles and bicycles shall be under the Motor Transport Corps as regards engineering, purchase, operation and maintenance, except armored cars and tractors and tanks, which will remain under the Ordnance Department. It also specifies that all appropriations for such should be placed at the disposal of one department and further that the special bodies required by each Army division, such as the ambulance for the Medical Corps and pigeon carriers for the Signal Corps, are to be designed by the respective departments to fit the standard chassis as specified by the Motor Transport Corps.



The Pullet tractor is a new four-wheel machine

## Show of Northwest Immense!

### Attendance on First Day Surpasses Huge Success of Last Year

MINNEAPOLIS, Minn., Feb. 15—The Northwestern Automotive and Industrial Exposition opened here to-day in a riot of color and with attendance for the first day which breaks all records. It is the greatest and most beautiful show Minneapolis ever has had, and from the way the crowds are pouring into the Twin Cities it is certain that more will see it than ever before. Attendance to-day ran considerably over the 13,000 mark, which beats last year even. The weather is ideal, and apparently the whole Northwest is interested. Dealers and farmers, to say nothing of the residents of the Twin Cities, are here, and they are thronging to the Exposition building where the 1919 event is being held.

#### Arrangements of Exhibits

The first floor of the Exposition building, with its new cement floor laid by the Government, which used the building as an army barracks for a time, is devoted to the tractor and motor truck displays, with the executive offices and other appointments, including the dancing floor, which is a special feature of the Minneapolis show. The second floor houses the motor cars and accessory exhibits, while the industrial exhibits are on the third, or balcony, floor. Taken all in all, it is a wonderful show and most attractive.

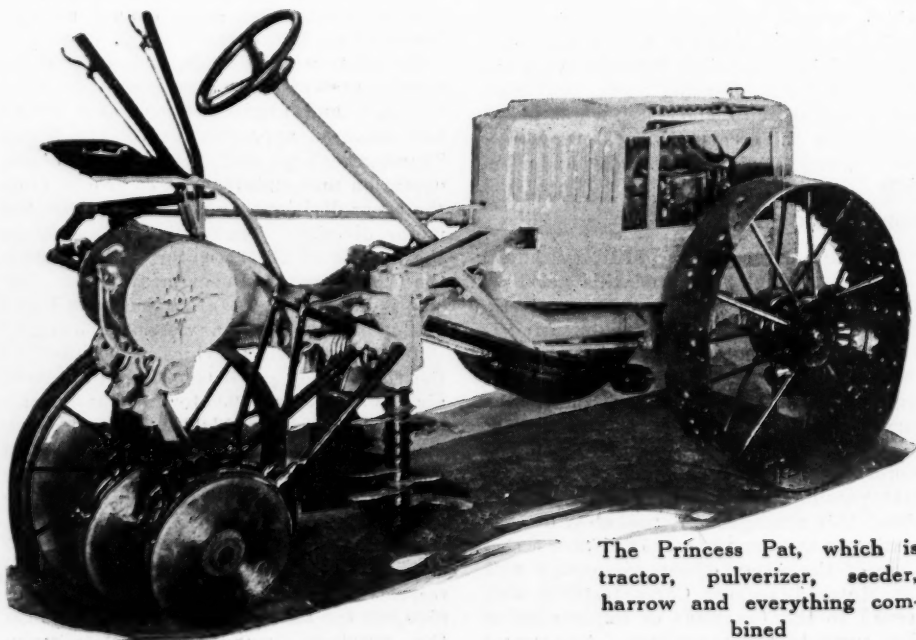
The decorative scheme is varied and elaborate. C. J. Tietzel of Chicago had this in charge and arrived in Minneapolis with several carloads of decorative materials and with the assistance of a small army of 100 men or more he has converted the interior of the bare, gaunt Exposition building into a thing of beauty. The color scheme on the first floor is gold and blue, but the real blaze meets the visitor upon reaching the head of the first staircase on

the second floor. Around the balcony are the panels used in the Coliseum at Chicago this year, with the big mural, symbolic pictures which adorned the ends of the Coliseum looking down on the motor car exhibit from either side. Two floors high is the ceiling, decorated in panels of many colors and designs. Suspended from the canopy are scores of small electric lamps, with lavender shades and tassels, which merely supplement the stronger light cast by large and brilliant nitrogen lamps.

The second floor has been divided into two sections, lavender and purple being the predominant tones in the west section, while Japanese effects rule to the east. In contrast to the white columns which sup-

port the roof of the building, there are eight square pillars of colonial construction topped with lighted domes. Scattered in artistic order are statues, jardinières and potted plants. Individual initiative in the way of decoration of the exhibits has been permitted to a considerable extent also, until the whole, while confusing as to scheme, presents a wonderfully dazzling and attractive appearance. In other words, considering the difficulties encountered in putting the decoration into place the result is to make something which will hold the attention and command the admiration of the visitors.

On entering the building at the main entrance the visitor is attracted on the



The Princess Pat, which is tractor, pulverizer, seeder, harrow and everything combined

one hand by the display of motor trucks and upon the other by the tractors. Of the latter there are sixty-three models, exhibited by thirty-seven concerns, and practically every phase and form of tractor design is represented. From the tiny garden tractor to the leviathan which develops 60 hp. on the drawbar and 90 hp. on the belt, they are all there.

The surprising thing about the tractor display, irrespective of the variety of design, is the great diversity of rating. In all there are twenty-eight horsepower ratings, indicative of the confusion that exists in the tractor world as respects this factor and indicating the necessity that exists for some standardization which will enable the purchasers of tractors better to judge of the relative power developed by the tractors they are asked to buy. To show how confusing this may be, of tractors which might be called one-bottom machines there are two, one each of 5-10 and 6-12 rating. The two-bottom tractors are represented by one 8-16, one 9-16 and one 9-18. In the three-bottom class are one 10-18, five 10-20, ten 12-20, three 12-24, seven 12-25, one 14-25, two 14-28, one 15-20, two 15-25, one 15-27 and seven 15-30. The four-bottom class contains one 16-25, two 16-30, five 18-36, three 20-40, one 22-45, one 24-36, one 25-45 and one 25-50. Larger tractors are represented by one 40-65, one 40-80 and one 60-90.

#### Various Exhibits

In addition to the regular tractors there is one motor cultivator, three varieties of small garden tractors and the Princess Pat, which is tractor, pulverizer, seeder, harrow and everything else combined. There also is a scattered but rather comprehensive display of tractor-drawn and tractor-operated equipment. This includes grain separators, silo fillers, plows, disk harrows, cultipackers, grain drills and other tillage implements. Included in this department, too, are wild oat separators, potato diggers and loaders and such equipment.

Special attention has been taken in several exhibits, either to make them particularly attractive, or else by cut-out chassis and parts displays, to give the visitors an adequate conception of the working of engine and transmissions. For instance, the Northern Rock Island Plow



Part of the industrial exhibit at Minneapolis this week

Co., displaying the Heider tractor, has a 12-20 electrically operated.

The J. I. Case Threshing Machine Co. is showing a 10-18 tractor cut out, operating and on a revolving pedestal and a 20-36 grain separator with cut-out panels showing the working parts. The Avery Co. has an 8-16 cut-out chassis, a 20-30 grain separator with cut-out panels and a parts display.

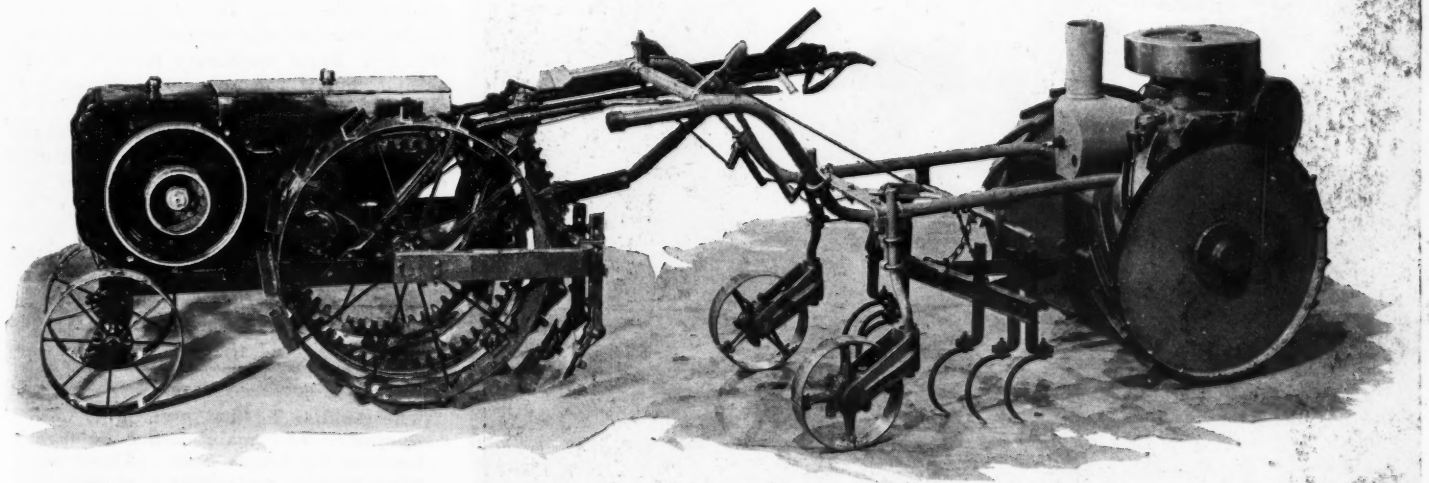
The Fordson is shown in white enamel and for the first time with a pulley. An engine, mounted upside down to show the operation of the cylinders and the relation of the parts of the transmission, is a novel feature of the Wallis Tractor Co. display. The Emerson-Brantingham Co. has a cut-out chassis of the new E-B AA model and an attractive parts display. The Liberty Tractor Co. has one model finished in white with patriotic colors. This particular model also will be shown at Kansas City.

Of tractors that are really new there is not very much. The new sixteen-valve 12-20 model of the Minneapolis Steel & Machinery Co., the Allis-Chalmers general-purpose tractor, the brand new Pullet

tractor, two new garden tractors, the Market Garden tractor and the Trojan and the Princess Pat Once-Over about catalog all that is new in models not shown before. In addition to these many of the models show improvements of greater or less importance, but for the most part the design and construction of the machines is pretty much what it was a year ago.

The 12-20 Twin City is briefly described elsewhere in this issue of *MOTOR AGE*. The other new tractor, the Pullet, has several novel features. It is manufactured by the Pullet Tractor Co., Minneapolis, Minn., and its maker says it is the result of five years spent in experimentation. The company now is ready for production and plans to build 500 machines this year. It will sell for \$2,750. It is a four-wheel type, worm-driven, of four-bottom capacity. Distinctive features on the Pullet are the unit frame, the flexible front axle, the one-piece wheels, electric governing, starting and lighting, unit construction, complete protection of all moving parts and ease of lubrication.

(Continued on page 31)

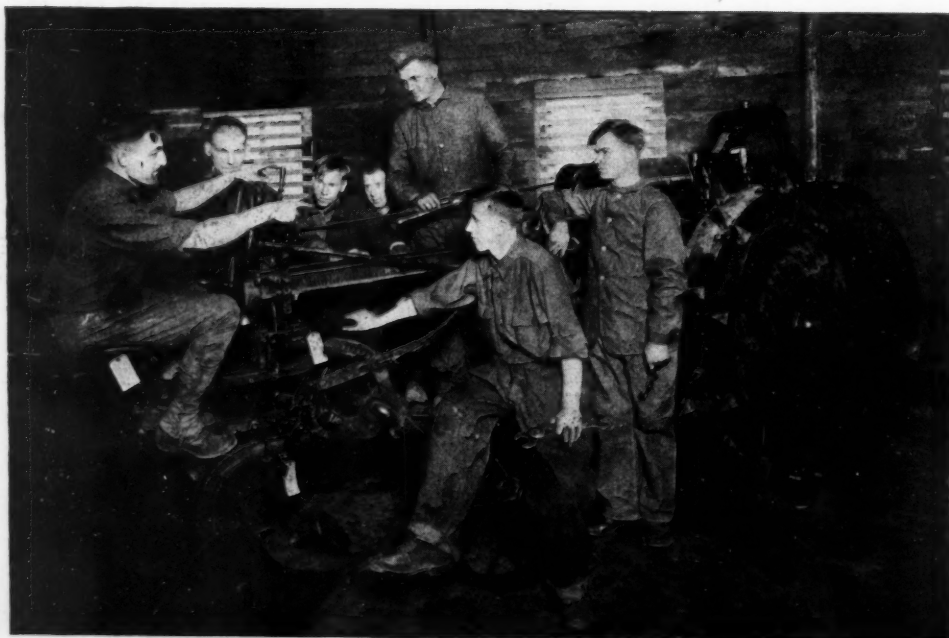
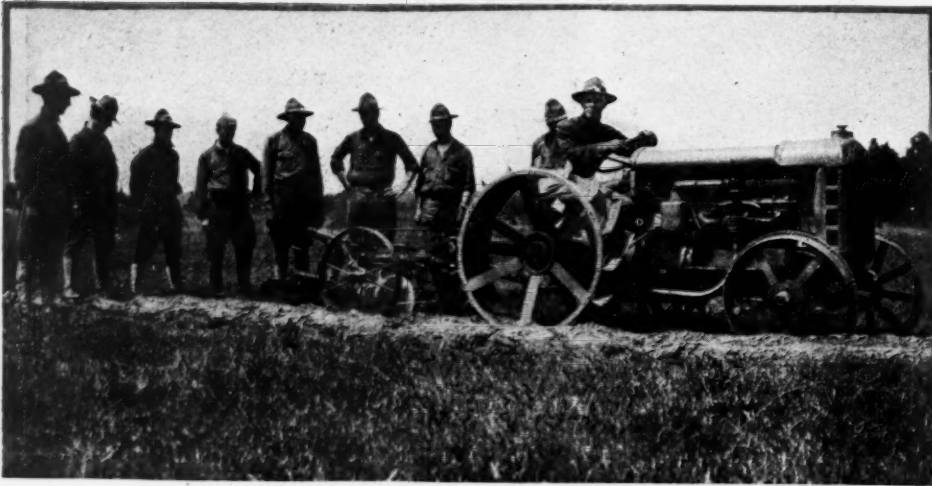


Control of the Trojan garden tractor is on handle

The Market garden tractor has several new features

# Back to Nature Via Tractors

Government Schools Train Soldiers to Operate and Maintain Farm Machines



ONE serious limitation to the wider use of farm tractors is the lack of knowledge of operation. Ordinary farm hands, many of whom have learned considerable of the motor car and the truck in the war, are now suited to become efficient tractor operators. There are thousands of others though, who know nothing of the tractor nor the gas engine, and to these men the tractor schools make a special appeal. These returning men are now ready to resume their former civilian pursuits. Those that are returning to the farm are given the opportunity to study in the schools that have been established the maintenance and the care that farm machinery should receive.

If every soldier who returns to the farm were educated in the use of farm machinery, especially the tractor, and made to realize that a greater intensity of cultivation can be had by the use of these machines, the country would be greatly benefited by the increased usefulness of the man. More food would be produced and at a lower cost. Time would be saved to the farmer, and the increased usefulness that each tractor-equipped farm would present would make America more than ever a provider to the world.

## Fills Two Needs

Two conditions can be co-ordinated: The tractor-equipped farm with nobody to maintain the tractor; the returning soldier who wants to go back to the farm, but who knows nothing, or very little at best, of the machine that has received a nationwide impetus since his departure. The factor that reconciles these two conditions is the Federal Board for Vocational Education, which has established schools over the whole country, where the men are taught a trade, or the knowledge necessary for them to know that they may enter into any industry.

The one subject being demanded by the soldiers more than all the rest is automotive. The men are allowed to choose their own subjects and the majority want to learn something of the motor car, the tractor, the truck, the airplane, the constructional features as well as the maintenance. Farm machinery receives a wide calling, hence the schools that teach of the farm machinery.

Gasoline engines are the universal source of power on the farm, so first the gasoline engine, its principles and method of construction are taught. Then the use of the engine, how its power is applied, is the next step. Then the operation and repair are gone into.

A good deal of tact is necessary in the handling of these men. While it is true they have elected their own course, they

The soldier is being taught both operation and maintenance of farm tractors by Uncle Sam. These are photographs of soldier's classes, if they can be called such, and show the practical work given

can not be lectured to forever, neither can much time be spent over books. Generally speaking, all these men are of the type that left off their "book learning" in the grades, and for them to go back to books now would be a tedious process and would avail nothing.

In the study of gas engines, the two-cycle and four-cycle engines are taken up. The two-cycle engines must not be forgotten, and since they are employed on several tractors their principle must be explained. The constructional part of the engine must be gone into very thoroughly. The men have been heard to say that they sometimes would want to start a shop of their own, so a knowledge of machine shop practice and the repairs that can be rendered with a lathe is essential. The operation of the tractor is learned through actual use. Some of the illustrations show the men out on the fields running a tractor.

One of these tractor schools is at Lakewood, N. J. The tractor equipment consists of a Moline-Universal and several Fordsons. A machine shop is operated together with the repairshop and this means the constructional features as well as the maintenance are brought out. This is a valuable work, for no doubt we soon will have the service station in the tractor field, as we now have the motor car and truck service station in the commercial field.

One of the largest schools in the country for automotive vehicles soon will be in operation with several thousands of students at Fort Sheridan, Ill. The educational work is under the direction of Maj. Fred P. Reagle, and W. A. Richards is supervising the work in the shops. It is hoped that as soon as spring comes the fields around the post will be under the care of the soldiers who are now studying scientific agriculture.

#### Four Weeks' Minimum

The men are kept at these schools for four weeks at a minimum. In the case where wounded men are sent to the school, it sometimes is impossible for them to assimilate knowledge as readily as the others because their physical strength does not permit of a strenuous day's labor, so these men are kept six weeks or longer if necessary.

It readily can be seen that the tractor presents a problem to the average farmer who knows nothing of machinery. The tractor manufacturer has done his best to develop a machine that is fool-proof, still the farmer can find more ways for the tractor to get out of order than the tractor has parts. When one considers that there are cases on record where grease cups have been filled with every possible kind of lubricant, anything from butter to tar, it is high time to consider the educational possibilities presented by farm machinery.

After the man is educated, what can he do to help the tractor industry? An illustration of the increased sales possibilities will serve as one lesson. The farmer's son has returned, has completed the course offered by the Vocational Board and is now back on the farm. He understands the tractor and its possibilities, but the older and more conservative still persists in the old methods. The son is the man to make the sale through. He can be appealed to where the older man can not.



If all the soldiers who are learning tractors return to farms, food production will be greatly benefited. Two big tractor schools are at Lakewood, N. J., and Fort Sheridan, Ill.

Many dealers do not care to handle tractors because the profit is eaten up in the service after the sale. There is a little study in psychology here. The older man who buys a tractor is not prone to tinker with the tractor should any small detail be inoperative. His mind is set in its way and rather than investigate and find out why, he would rather dismiss the whole subject by calling up the dealer and demanding service that is part of the sale bargain but which soon eats up the dealer's profit. The younger man, who has been educated to the tractor, can clean the distributor points himself, should the engine be missing from this cause, and will do so rather than call up the dealer and wait a day for him to come down and make an adjustment that requires about 15 min.

These trained men soon can become efficient service men for the tractor dealer if they take up this sort of work. There is a great need for men who qualify in this field, and perhaps these men can fill the vacancy.

#### CHANGES FOR PEACE

Detroit, Feb. 14—Changes have been made in the Anderson Electric Car Co. operation to meet the requirements of post-war business. Although additions were made to both the Detroit and Cleveland plants of the company to handle ambulance body and other Government contracts, a survey disclosed the necessity of more space, increased capital and rearrangement of the manufacturing facilities for electric trucks.

It has been decided to segregate manu-

facture of industrial trucks and motors for passenger cars in the Cleveland plant and devote the present Detroit factory exclusively to body building, painting, trimming and fender production. The electric motor car department will be moved to a new factory where the chassis will be built and cars completed and shipped.

Administration of the Cleveland factory and the body plant will be under the direction of the Anderson Electric Car Co. The electric motor car business will be incorporated under the trade name of the Detroit Electric Car Co.

#### NEW HERSCHELL-SPILLMAN

North Tonawanda, N. Y., Feb. 14—The Herschell-Spillman Co. has been reincorporated under the laws of Massachusetts with a capitalization of \$1,750,000 and has taken over all the assets and property of the old company. Plans for extending the plants and increasing production are under consideration. B. W. Birdsall is president and general manager of the new company and associated with him are: Vice-president and chief engineer, E. O. Spillman; treasurer, Thomas C. Perkins; assistant treasurer and secretary, M. J. Tovell.

#### ROAMER PLANT BUSY PLACE

Kalamazoo, Mich., Feb. 14—The Barley Motor Car Co., maker of the Roamer passenger car, has been running normal capacity for thirty days and expects to increase its production 200 per cent within the next months. Four machines are turned out daily. The 1919 schedule calls for 200 machines.



Madison Square Garden during New York truck show, the first since 1913

## New York Truck Show Success

### Comparison With Chicago Indicates Diversity of Displays at Each Exhibition

**N**EW YORK, Feb. 15—New York's truck show closed here to-day after a six-day run in which the same success that marked the truck show at Chicago last week was repeated. Like Chicago, this is the first held in New York proper for several years, in New York since 1913 and in Chicago since 1912. Both dealer events, the results were more than satisfactory and the exhibits were so divided between the two that a visitor to both shows beheld something new at each and was the better off with a wider range of trucks to choose from than if he had attended only one show.

Twenty-six of the fifty-six makes of trucks at New York were not at Chicago; twenty-two of the fifty-two makes at Chicago were not at New York. Four brand new trucks, brought out in the last six months were here—the Oldsmobile  $\frac{3}{4}$ - to 1-ton, the Schwartz  $1\frac{1}{2}$ -ton internal gear-driven; the Shaw 2-ton; and the West 2-ton electric.

Those makes on display in New York and not at Chicago included the following: Atlas, Columbia, Corbitt, Denby, Giant, Hall, Kelly-Springfield, LaFrance, Larabee-Deyo, Maccar, Menominee, Oldsmobile, Overland, Packard, Parker, Rowe, Schwartz, Shaw, Sterling, Sullivan, Traf-

fic, U. S., Ward electric, West electric, Wichita and Wilcox.

Similarly, those makes at Chicago and not at New York are: Available, Brockway, Chevrolet, Commerce, Couple-Gear, Dorris, Ford, F. W. D., Gary, G. M. C., Hendrickson, Indiana, Kissel, Mutual, Panhard, Patriot, Pierce-Arrow, Sandow, Signal, Walker electric and Winslow steam truck.

Viewing the show as a whole, there was a noticeable tendency toward the increased use of pneumatic tires on trucks up to 2-ton capacity. Perhaps the most conspicuous example of this kind was the Rowe 3-tonner, equipped with 38 by 7 in front and 42 by 9 pneumatics in the rear and designed to run at a speed of 30 m.p.h. with a full 3-ton load. The Rowe truck further is characterized by the use of an 8-cylinder Herschell-Spillman  $3\frac{1}{4}$  by 5 engine with an S. A. E. horsepower of 33.84. The new  $3\frac{1}{2}$ -ton Republic may also be had with Firestone giant pneumatics at an extra cost and the model exhibited at the show was mounted on 38 by 7 pneumatics in front and 44 by 10 in. pneumatics in the rear.

A large proportion of the chassis shown were equipped with some form of closed cab for the driver's better protection. Several of these were of the built-up type with

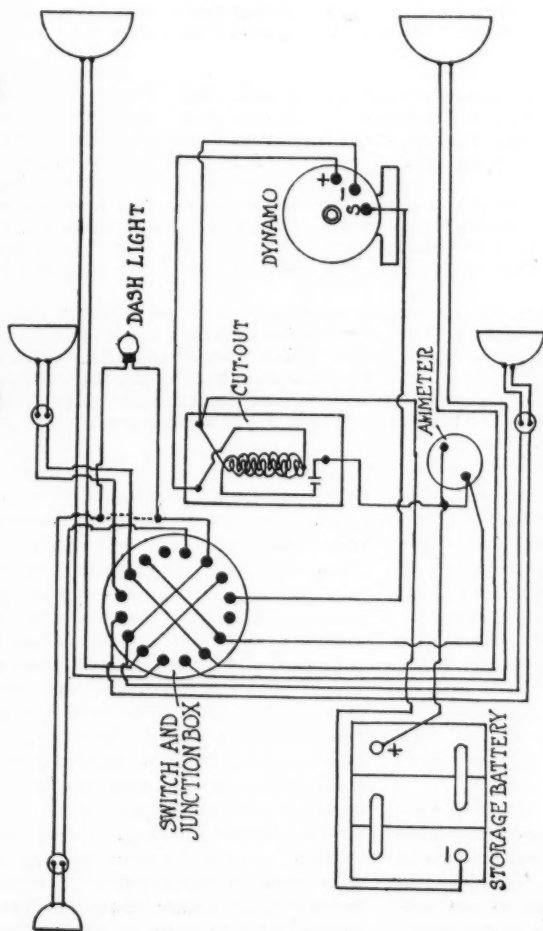
wood doors and drop sash windows. Others, notably that on the Hall  $3\frac{1}{2}$ -tonner, was provided with fabric side doors with transparent windows in an integral unit which may be rolled up out of the driver's way under the roof of the cab when it is desired to have the cab open. Great advancement was shown in fastening the cab doors and sashes, so that when the cabs are shut they are just as weatherproof as a passenger car sedan. Cushions in the cabs appeared to be covered with good grades of imitation leather and in many cases were mounted on springs to give easier riding.

Along with the many cabs shown, there were several very excellent examples of the body builder's art. In this respect the bodies built by the Fred Roeder Mfg. Co., Brooklyn, N. Y., were very conspicuous. One of that concern's bodies mounted on a 5-ton Sterling chassis attracted considerable attention. Almost every kind of body type was seen including convertible platform, side stake and low side types; pay-as-you-enter buses; van bodies; large and small dump designs and special panel jobs with interior shelving.

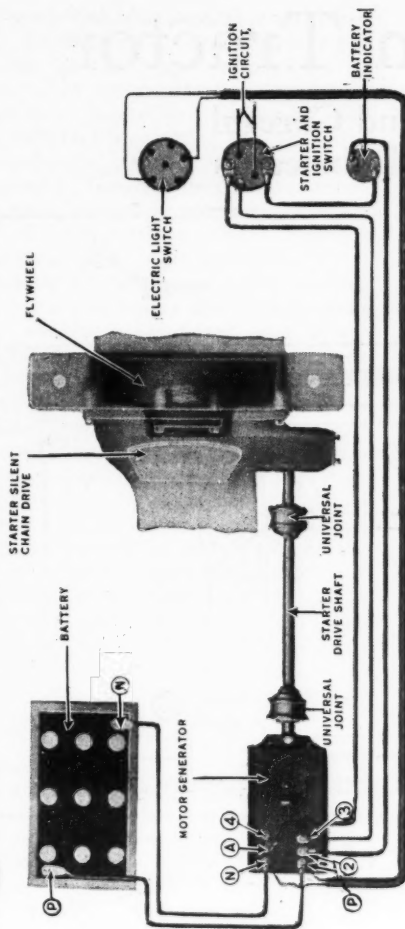
Perhaps the most interesting of the convertible types was a steel body mounted

(Concluded on page 29)

# Motor Age Wiring Diagram Chart No. 16



Gray & Davis on 1914 Chalmers

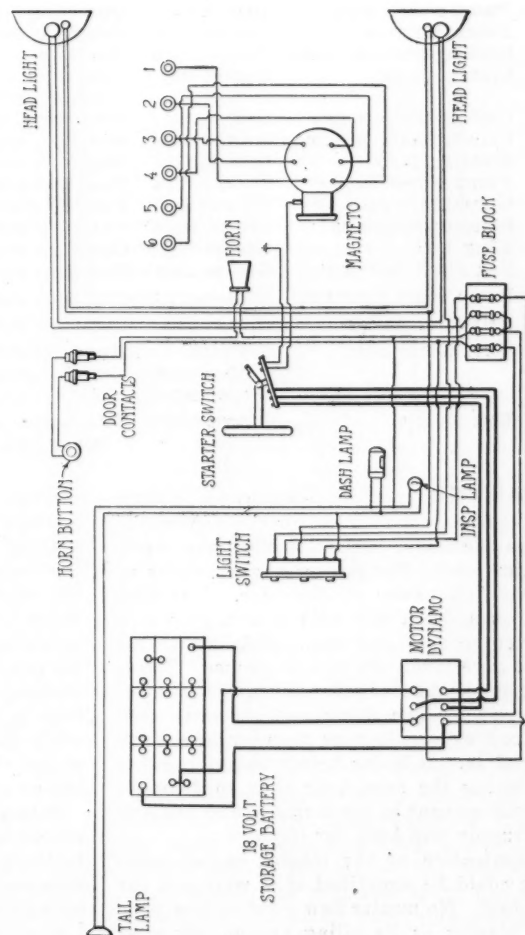


Gray & Davis on Chalmers 6-40

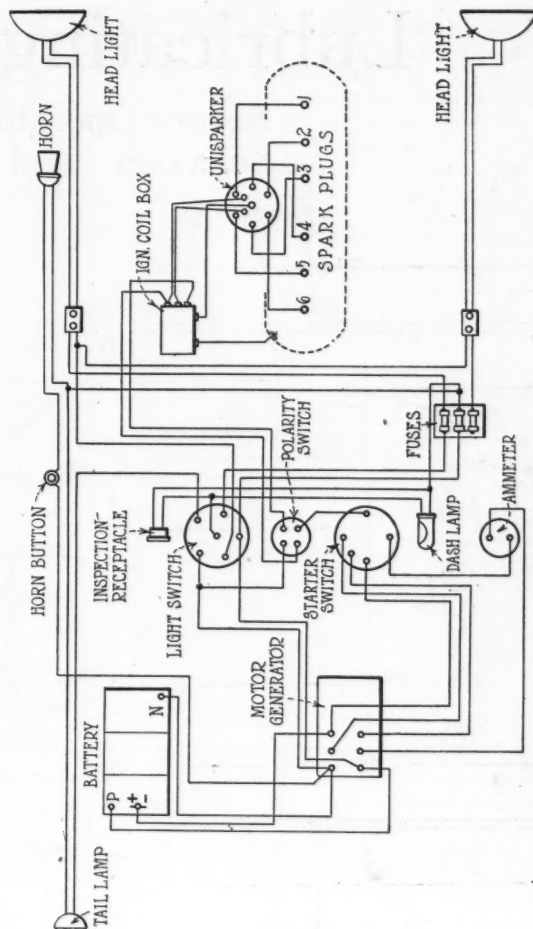
Alter—Nov. 14  
 Buick—Nov. 21  
 Cadillac—Dec. 19  
 Chevrolet—Nov. 28  
 Cole—Jan. 23  
 Dodge Brothers—Dec. 12  
 Ford—Jan. 30

Hudson—Dec. 5  
 Hupmobile—Feb. 13  
 Krit—Feb. 6  
 Locomobile—Jan. 23  
 Marmon—Jan. 9  
 Maxwell—Jan. 16  
 Mercer—Jan. 23

Mitchell—Jan. 9  
 Oakland—Jan. 2  
 Oldsmobile—Jan. 23  
 Overland—Nov. 7-14  
 Regal—Feb. 6  
 Scripps-Booth—Dec. 26  
 Studebaker—Dec. 26



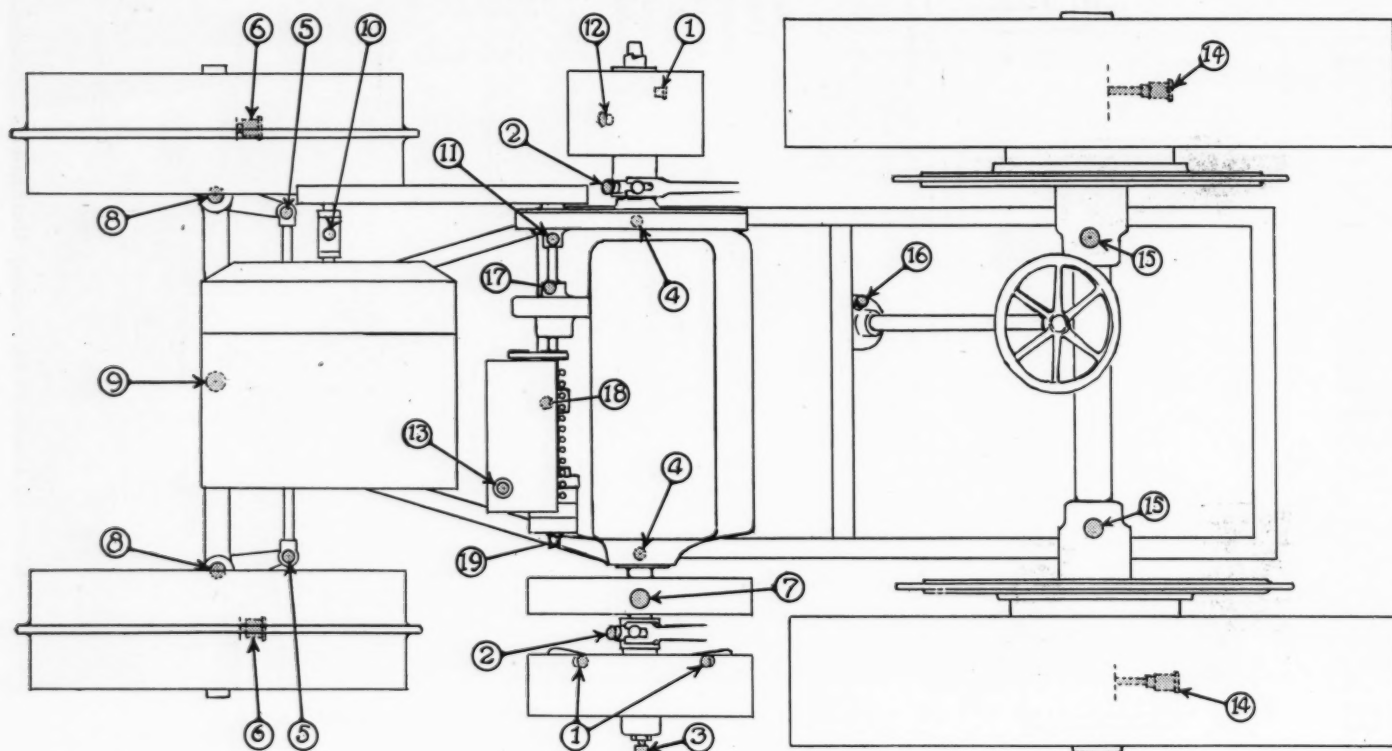
Entz electric system on Chalmers 26



Wiring of Chalmers 26, showing how ammeter is connected

# Lubricating the Farm Tractor

Severe Operating Conditions Demand Careful  
Selection and Application of Lubricants



No.	Name of Part	How Applied	How Often
1	Pump rocker arm	Grease cup	One turn every 2 hr.
2	Eccentric gear	Grease cup	One turn every 5 hr.
3	Clutch spreader arms	Grease cups	One turn every 6 hr.
4	Clutch spider	Grease cup	One turn every 5 hr.
5	Clutch shifter rings	Grease cup	Two turns every 2 hr.
6	Countershaft bearings	Grease cups	One turn every 5 hr.
7	Steering pins	Grease cups	One turn every day
8	Front wheel hubs	Grease cups	Two turns every 2 hr.
9	Crankshaft gear	Oil cup	Fill cup every day
10	Steering knuckles	Grease cups	One turn every 5 hr.
11	King bolt	Grease cup	One turn every 5 hr.
12	Fan shaft bearings	Grease cups	One turn every 2 hr.
13	Pump shaft bearings	Grease cups	One turn every 5 hr.
14	Belt idler pulley	Grease cup	One turn every 2 hr.
15	Mechanical oiler	Through filler cap opening	Keep reservoir filled with good cylinder oil
16	Belt pulley	Grease cup	Two turns every hour when using belt

No.	Name of Part	How Applied	How Often
17	Idler gear	Grease cup	One turn every 2 hr.
18	Camshaft bearings	Grease cups	One turn every 2 hr.
19	Differential bearings	Grease cups	One turn every 5 hr.
20	Rear wheel hubs	Grease cups	One turn every day
21	Rear axle bearings	Grease cups	One turn every 2 hr.
22	Steering gear case	Pipe plug	Fill with grease every five or six months.
23	Fuel pump eccentric	Grease cup	One turn every 5 hr.
24	Eccentric gear shaft	Grease cup	One turn every 5 hr.
25	Magneto shaft	Grease cup	One turn every 2 hr.
26	Pump shaft bearings	Grease cup	One turn every 2 hr.

The above does not take in parts such as valve rocker arms, spark and throttle lever joints, governor bearings, radiator trunnions and similar parts, which should be oiled, twice or three times a day when the tractor is in use, by the squirt can. Where a high-tension magneto is fitted, it should be oiled with a very light oil about every fifteen days, applying a drop or two at a time.

**T**RACTOR engine lubrication differs quite a bit from motor car engine, because the latter carries a relatively much lighter load. The tractor engine works at nearly full power all the time. You cannot coast down hill with it and give it a chance to rest and cool. This means we must give much thought to proper lubrication on the tractor job. A heavier oil must be used for one thing and the crankcase drained every night or morning and fresh oil put in. It is far better to put in some oil during the noon hour than to dump in a great amount in the morning and imagine the supply will keep for the day.

Lubrication of the tractor engine probably could be simplified if it were not for the dust. No matter how good or how poor the tractor or its oiling system, all must

combat the dust evil. Of course, those tractors fitted with some means for separating the dust from the air going into the carburetor are pretty well protected, but those without simply suck the dust-laden air into the cylinders, where it builds up with the carbon and then begins the process of cutting up the cylinder walls, pistons, rings and bearings. It is well to bear in mind that those air cleaners using cloth for a strainer will allow some dust to get through and require frequent cleaning or replacing.

Strange as it may seem, much of the oil placed in some tractor engines never gets to the parts it ought to lubricate. This is because the crankcase leaks. When oil is seen in large globules hanging to the bottom of the crankcase and the under struc-

ture, make up your mind that a great percentage of the oil is being sprinkled over the field where it does no good. Do not imagine that sloppy-looking exteriors go with successful tractor engine operation. If everything is right, the crankcase and cylinders should be almost dry on the outside even when the machine is used a great deal. When a tractor engine throws oil around the field it is time to go after the crankcase joints. New gaskets properly applied with shellac and the studs carefully tightened will keep the oil in. Leakage around the shafts can be reduced by centrifugal oil rings or felt packing.

With so many tractors burning kerosene it is well to remember that this fuel is heavier and denser than gasoline, which means it burns more slowly and therefore

imparts more heat to the cylinder walls and pistons. In addition to this we must use more heat for the proper combustion of kerosene, all of which raises the operating temperatures. Hence an oil must be used and in sufficient quantities to cope with these conditions. Ordinary oil is no good in tractors; in fact, the best tractor insurance is good, expensive oil that has a fire test of at least 600 deg. Fahr. Friction does not wear out oil, but heat does.

Practically all the four-cylinder vertical tractor engines of to-day are oiled by some sort of combined force-feed and splash system, a typical layout being shown herewith. This system does not differ from that used in motor car engines and is quite generally known. Many of the tractors using double-opposed horizontal engines employ a mechanical lubricator which sends oil in the correct proportions to the various bearings. This is shown in another view. Here oil is carried in the tank, usually placed on top of the engine, and carried to the bearings by the leads marked A, B, C and D. The lubricator is driven in this case from the camshaft by the belt E, and as the engine speed varies the rate of oil flow from the lubricator will vary also.

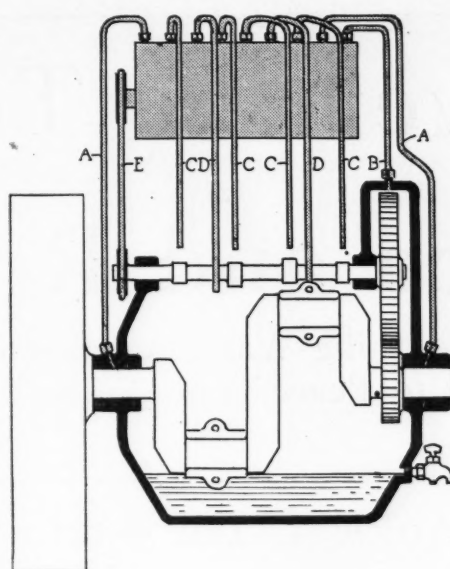
#### Supply of Oil

The leads A supply the main bearings, C the cams and tappets, while those marked D are directly over the center of the cylinders, and the oil from these lubricate the pistons and cylinder walls. Some of this also drips through holes in the pistons on the wristpins. Oil is maintained in the crankcase up to the level of the petcock for oiling the connecting rods. In some cases the rods are oiled from leads directly above them, whence it flows into channels on the rods and then into holes to crank-pin bearings.

The variety of bearings found on the tractor means that a different method of lubrication must be used for each. Thus the cylinders which encounter the greatest heat demand a different lubricant from the rear axle gears or transmission gears. Where the bearing pressure is too great for thin oils harder oil or grease must be used. This is also true where only a small amount of lubricant is needed.

Every tractor is fitted with grease cups, and although these are not very pretentious-looking articles they mean life or death to the bearing surfaces they are supposed to look after. There is a right and wrong way to fill a grease cup and turn it down. In the first place when the cap is off and being filled with grease the operator should pack the grease as much as possible. If this is not done, the cap is screwed on and given a few turns, the operator believing the grease going into the bearing, whereas it is only being compressed in the cup itself. Of course, if the process of turning is kept up long enough, the grease eventually will get to the bearing surfaces, but considerable wear already may have taken place. Grease cups should be turned down so far that grease can be seen coming out from the ends of the bearing caps. This means there is a film of lubricant over the entire length of the bearing.

Keep the threads of the grease cups clean. If dust gets on them and is not wiped off, it gets up into the grease as the



Typical layout of combined force-feed and splash system

cap is screwed down. This makes the grease gritty and cuts bearings. Always wipe the exterior of grease cups and occasionally clean the inside with kerosene.

Some parts of the tractor are oiled with the oil can through small holes. These always should be cleaned out before applying the oil with a nail or awl. If this is not done, most of the oil runs over the bearing cap and is wasted. Other tractor parts run in an oil bath, and the fact that they do is one of the chief reasons why they are neglected by the operator, who imagines that after he once has put oil in these parts they are good for the whole season. The best plan is occasionally to remove the inspection plates and examine the parts. Once in a while metal particles get loose from the inside of cases or other foreign matter gets in, and when this mixes with the oil it forms a cutting compound and may ruin the wearing surfaces. Therefore, the safest plan is to remove the inspection plates and take no chance.

The lubrication of tractor transmissions and differentials is about the same in every case. As a rule, a semi-fluid oil or gear compound is all right in the transmission case, the amount usually being specified when it overflows from a drain plug in the side of the case. This assures a constant level. The bevel gears, pinions, ring gear, driving chains, etc., are lubricated with heavy oil or grease. As a rule the driving bevel pinion shaft or countershaft bearings are taken care of by grease cups. No matter what the lubricant used or where used it is a good plan on a tractor frequently to drain out all of it and wash the parts with kerosene, before applying new lubricant.

#### NEW YORK TRUCK SHOW

(Concluded from page 26)

on a 6-ton Packard. It was made by the Young Hoist Co., and raised by means of a Young horizontal hoist. It had a steel platform with low removable steel sides. With the low steel sides in place the body serves to haul heavy bulk material such as excavated ground, sand, cement and the like.

Additional side members may be placed on top of the low sides mentioned to give a larger volumetric capacity for handling bulky but lighter goods than would be carried when the low sides alone are employed. The upper sides are held in place by special front and rear frames, the rear one of which also is provided with a tailgate for rear dumping. The Economy dump body designed to fit any 1-ton chassis and selling at the moderate price of \$250 complete with a hand hoist also was shown. The body is made of 12-gage steel throughout and has a cubical capacity of 35 ft.

The 750-lb. Ward special electric truck on display excited considerable comment on account of a new front step and hinged dashboard. The Ward vehicle was designed particularly for the house-to-house delivery of bread and milk where stops are very frequent. The new step, which is in front of the forward wheels and about 12 in. off the ground, also serves as a bumper and when the right half of the vertical dashboard is swung around over the left half, makes it possible for the driver to get in and out of the truck from the sidewalk in the quickest possible time.

#### Car Converters Shown

In addition to the various makes of complete vehicles, five makes of passenger car converters were shown: Converter, Dearborn, Graham Brothers, Guaranty and Truxton. Three makes of trailers were also on display. These include Lapeer, Troy and Warner. Another innovation at the show was the display at a motor truck exhibition of farm tractors, no less than four such being shown.

In the way of new models the Acme 5-tonner, whose price has not yet been determined, is fitted with metal wheels as standard equipment and drives from a Continental 4½ by 6 in. modified class B engine through a Borg & Beck dry-plate clutch and a three-speed Cotta selective gearset to a Timken worm-driven rear axle. The new Columbia model is a 1-ton internal-gear-driven truck with a Continental unit powerplant engine and a Russel internal-gear rear axle. The new Corbitt model is a 5-tonner which is fitted with a 5¼ by 5¼ in. engine instead of a 4½ by 6 in. Continental unit as formerly.

Rainier exhibited a complete line of five models of which two, a ¾-ton special and a 2-tonner, both worm-driven, were new. The ¾-ton special is fitted with a 3½ by 5½ in. Continental engine, Brown-Lipe dry-disk clutch and Brown-Lipe gearset and a Timken rear axle. The 2-tonner uses a Continental engine, Brown-Lipe clutch and gearset and a Wisconsin worm-driven rear axle.

Another new model of an established line was the Stewart 3½-ton internal-gear-driven truck. It is fitted with a Continental 4½ by 5½ in. engine with an Eisemann high-tension magneto and drives through a dry-disk clutch and four-speed selective gearset in a unit powerplant.

The Wilcox line of trucks, shown in New York for the first time, has been slightly redesigned. Each model has a four-speed gearset and in the case of the long-wheel-base models, the propeller shaft has three universals, the center one being carried in a self-aligning bearing.

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Series No. 2

## Article II—Tractor Sales

By T. P. Bowman

**T**HE tractor industry is at its highest point. By that it is meant that the prominence of the tractor has never been so eminent at any time as it is at present. Just as the passenger car industry was held at practically a standstill for a considerable period because of the skepticism enveloped about it, so has the tractor industry suffered until recently, when it seemed that over night the tractor sprang up with all its advantages brilliantly appealing to the public and crying out to the whole world its advantages, its merits and hundreds of convincing evidences of its necessity.

The dealer of to-day has not the task of convincing the farmer that he needs a tractor. The farmer knows that he needs it. The only thing the farmer does not know is the exact tractor to buy, and the only thing the dealer has to do is to select the best tractor, according to his judgment, and convince the farmer that his judgment is correct. The dealer who can do this will be, and is, a successful dealer.

### Selecting a Tractor

In saying that all a dealer has to do is to select the right tractor it is not to be intimated that selecting a tractor for an agency proposition is by any means a small matter, because it is not. It is the biggest part of the success or the failure of the tractor agency.

A tractor which would be a success and a sales winner in one part of the country would be an entire failure in another part of the country. It would be utterly irrational to believe that the small tractor which is designed for the work of a 100-acre farm would be entirely practical and as useful on the 200- or 300-acre farm. Again, a small tractor may be suitable for farms above the designated acreage, if the soil is exceptionally light and easily worked. Then there is to be considered the amount and class of work, besides plowing and the like, which may be required of the tractor.

For the dealer to decide upon the tractor he will handle requires a great deal of study. First, he should decide and map out the territory which he decides to cover. When this is done, the dealer should acquire, or compile, an accurate directory of the farmers in the chosen territory. After this is done a card index, such as given

herewith, should be made and accurately written up. Each farmer and all information relative to that particular farm and farmer should be noted, as described.

In most cases it is possible to obtain a fairly accurate list of farmers and their addresses from the office of the county auditor of the county in which the several townships are located, but even though this is done it is advisable to check the list, because if the farmer is a renter his name would not appear on the list, as he would not be a taxpayer of real estate. The more certain and accurate way of compiling the index is to call personally on each of the farmers in the territory and at the same time procure all the information which may be required. This would have to be done eventually, and if it is done in the beginning the assurance is at hand that the index is correct at the beginning and names which may otherwise be wrong are to the dealer's knowledge correct.

For example, we have Ralph Jones on whom the dealer has the address noted. An interview with Mr. Jones gives us the size and exact location of the land he is farming. We learn that there are 210 acres under cultivation, all of which is plowed each season. One hundred sixty acres of the cultivated land will be harvested with the tractor. It is contemplated that there will be 6 miles of road work to be done with the tractor, besides other work which consists of sawing wood, grinding feed, etc.

Mr. Clark made the interview and noted the remarks which appear under the remarks heading of the card.

### Before Filing Card

Before filing this card away for future reference an exact duplicate must be made. This will be filed in a separate file under a tabulation which would indicate the size of tractor recommended for Mr. Jones. As many divisions as may be deemed necessary may be given this index, but ordinarily four divisions will be sufficient—small, medium, large and extra large. In this particular instance it would seem advisable to place Mr. Jones under the "Medium" heading of the file. As each farmer is interviewed the same process is carried out until the end, at which time the dealer

will have an alphabetical index of all the farmers in his territory as well as a guide to the type of tractor mostly in demand.

A great deal of very valuable information can be obtained from the performance records of tractors and their tests which are conducted under official supervision, all of which are constantly being published by the foremost tractor papers. A dealer who contemplates entering into the tractor sales industry should not fail to attend any or all tractor demonstrations which are being conducted in or near his vicinity. The dealer who is a close observer will learn a great deal at a tractor demonstration, especially if a considerable number of makes of tractors are represented and the demonstration is well attended by the farmers of the neighborhood.

### Observe the Farmer

First, direct your attention to the farmer who is observing the performance of the different tractors as they are at work in the field. The farmer interested as a likely purchaser will go into certain details which may be overlooked by the dealer. Certain details which may appeal to the dealer as a redeeming feature may not appeal to the farmer in the same manner because the dealer and the farmer observe the proposition from different angles. It is the natural tendency of the dealer to form his opinion of a tractor as he would in the selection of a passenger car. Too much attention may be given to the general appearance, the design and style of the job. In fact, attention may be given to very things which would not be of any consequence to the farmer.

The farmer, when buying a piece of machinery, is not influenced so much by the style and general appearance of the article as he is in the apparent rigid and serviceable construction of it. Therefore, if the dealer is to make a selection from the farmer's point of view, it is necessary to become acquainted with and know the farmer's point of view. There is no better or quicker way of doing this than to mingle with farmers and make note of comments in regard to this or that tractor during the demonstration.

If during the demonstration you learn that a certain make of tractor has the approval of 40 to 60 per cent of the farmers,

it is quite certain that no mistake can be made in the selection of that particular tractor, provided it also appeals to the dealer. However, too much confidence should not be placed in the results arrived at during the one demonstration. A demonstration in another part of the country may result in the overwhelming popularity of an entirely different machine.

If possible, an average should be arrived at after having summed up the results of several demonstrations. Where it is impossible to attend demonstrations the next best thing to be done is to closely observe the performance records as published by authoritative trade papers. Of course, in this you have only the performance record to judge from, because the farmer's point of view is never given. Again, through some misfortune to the exhibitor, a very good tractor may have fallen behind the performance of an inferior one and thereby be given a poor showing through no fault of the construction or design of the tractor. The writer has in mind a demonstration in which several tractors were represented. Two of these tractors which, in the writer's opinion, were the inferior two attracted the attention of and received the stamp of approval of the witnesses. The argument of the exhibitor was in that on account of the excessive rate of speed attained by the tractor twice the amount of ground could be covered in the same amount of time.

Of course, this argument was necessary because of the smallness of the tractor and the fact that they could handle only a two-bottom plow instead of three or four as was done with other tractors at the time, but at a slower rate of speed. These two tractors, being smaller than the others, made them less expensive, which was the exhibitor's chief point of argument. At

NAME Ralph Jones  
 MAIL ADDRESS R.F.D #2  
 TOWNSHIP Jasper Location N 1/2 Section 24  
 ACRES 340 UNDER CULTIVATION 210  
 AVERAGE ACREAGE PLOWING 210  
 ROAD WORK 6 miles HARVEST 160  
 OTHER WORK Saw wood - grind feed  
Silo  
 INTERVIEW By Clark  
 REMARKS Wants a tractor - has talked  
with Talkes very favorably of  
the tractor

Specimen card index record made by tractor dealer

any rate, the farmer's knowledge of tractors was greatly limited at that time. So was the dealer's, and the consequence was that the results of the demonstration persuaded the public beyond the limits of good judgment.

It was not very long, however, before actual performance made known the lack of judgment displayed by the spectators and purchasers of the well-demonstrated tractors. Like experiences have taught the

dealer and the purchaser not to place too much confidence in the exhibit. The farmer has learned this and has not forgotten it, consequently he must depend upon the judgment of the dealer in his district to decide upon the tractor he will buy. This load being placed upon the dealer, it is the dealer's duty to use every care and precaution possible in his selection, because in his selection depends the success or failure of his agency.

## Show of Northwest Opens With New Attendance Mark

The Pullet frame is a solid casting of semi-steel, the cases for transmission, clutch and final drive being cast in the one frame unit. This unit frame does away with a universal joint or flexible driving shaft and all joints of whatsoever kind in the frame construction. It is claimed this type of frame presents the utmost rigidity between the engine and drive wheels and that it is impossible for any part of the Pullet to get out of alignment. This is patented, as is also the flexible front axle. It is so constructed that inequalities have no effect upon the tractor, all strains being taken care of by the axle itself. The wheels, both front and drive, are cast in a solid piece. The governing, starting and lighting are electrical, Remy equipment being used. All moving parts are entirely inclosed, with the gearset and final drive running in oil. There are but two grease cups on the entire machine, on the front wheel steering knuckles, and these and the crankcase are all that require daily attention. The engine is a kerosene-burning Beaver, with 4 1/4 by 6 bore and stroke. The clutch is Borg & Beck, contained in a unit case which may be taken off without disturbing any other part of the tractor. Timken bearings are used throughout. Every part of the tractor is readily accessible, and because of unit construction any

(Continued from page 23)

unit may be taken out without disturbing any other.

The Market Garden Tractor Co., Minneapolis, Minn., is showing a new garden cultivator which has several new features. The engine is a two-cycle Verac air-cooled engine, with flywheel running horizontally and with magneto built in the flywheel. Final drive is worm. The machine develops 7 hp. and will sell for \$295. The control is on the handles within immediate reach of the operator. A feature also is the hand lift for the cultivating attachment and the swinging adjustment for crooked rows.

The other new garden tractor is manufactured by the Trojan Mfg. Co., Minneapolis, Minn., and will sell for \$350. It has a 5 by 5 horizontal cylinder Hite engine with magneto built in the left wheel and the clutch in the right wheel. Final drive is roller pinion and bull gears. Control is on the handle, convenient for the operator, and here also is a lever which raises and lowers the cultivating gangs by a ratchet at the rear of the frame. The speed of the engine is variable, running from 600 to 1000 r.p.m. At 600 the speed is 2 m.p.h.; at 800, 2 1/2 m.p.h., and at 1000, 3 1/4 m.p.h. The Trojan is fitted with a 5- by 7-in. pulley. The drawbar is U-shaped and is attached rigidly to the frame of the tractor.

The cultivating shovels or other implement gangs are attached to the drawbar by clips.

The Princess Pat Once-Over tractor-tiller is manufactured by the Scientific Farming Machinery Co., Minneapolis, Minn., and will plow, disk and harrow at one operation. The plow and tiller may be removed easily, leaving the tractor available for any other purpose. The Princess Pat is a combination of plow, rotor and powerplant for tillage operations. The engine is a four-cylinder LeRoi, with 3 1/4 in. bore and 4 1/2 in. stroke and runs at any speed from 800 to 1200 r.p.m. The distinctive feature is the rotor, which stands in an upright position at the right of the moldboard of the plow. It is geared at the top to the shaft of the engine and can be regulated to run at any speed from 400 to 600 r.p.m. The blades on the rotor can be set at any desired intervals by collars. This contrivance receives the furrow slice as it leaves the moldboard and cuts it all to pieces before it reaches the ground. This completely pulverizes the soil and prepares the seed bed at the time the plowing is done. The Princess Pat has many other novel features also of which there is no space to speak here.

Many of the tractors shown at the Minneapolis show are old favorites and have

(Concluded on page 47)

# Motor Age Monthly Guide to Tractors and

Line No.	Manufacturer	Tractor	Drawbar horsepower	Belt horsepower	No. plows recommended	Size separator recommended	Pounds pull drawbar	Weight	Price	Traction	Diameter drive wheels	Make of engine	Cylinders
1	Acme Harvesting Machine Co., Peoria, Ill.	Acme	12	25	3		2600	6000	\$1,800	2 Wh.	54	Beav.	4 Ver.
2		Acme	12	25	3		2600	6800	2,250	2 Cr.		Beav.	4 Ver.
3	Adams Co., Maryville, Ohio	Adams	9	13	1-2			5500	850	2 Wh.	36	Herc.	1 Hor.
4		Oil Pull	12	20	3	22 x 36	2150			2 Wh.	51	Own	2 Hor.
5	Advance-Rumely Co., Laporte, Ind.	Oil Pull	16	30	4	28 x 44	2850			2 Wh.	56	Own	2 Hor.
6		Oil Pull	20	40	5-6	32 x 52	3750			2 Wh.	64	Own	2 Hor.
7		Oil Pull	30	60	8-10	36 x 60	5900			2 Wh.	80	Own	2 Hor.
8		Allis-Chalmers	18	30	3-4		3000	5300		2 Wh.	50	Own	4 Ver.
9	Allis-Chalmers Mfg. Co., Milwaukee, Wis.	Allis-Chalmers	10	18	2-3		1650	4800		2 Wh.	56	Own	2 Opp.
10		Allis-Chalmers	6	12	1		1000	1850		2 Wh.	48	Le Roi	4 Ver.
11	Andrews Tractor Co., Minneapolis, Minn.	Andrews	12	20			1900	5250	1,000	2 Wh.	48	Veer.	4 Opp.
12	Appleton Mfg. Co., Batavia, Ill.	Appleton	12	20		24	2200	4900		2 Wh.	54	Buda	4 Ver.
13		Aultman-Taylor	15	30			3300	7800		2 Wh.	70	Wauk.	4 Ver.
14	Aultman-Taylor Machinery Co., Mansfield, Ohio	Aultman-Taylor	18	36	4-6	30 x 46	4000	12500		2 Wh.	70	Own	4 Opp.
15		Aultman-Taylor	25	50	6-8	36 x 56	5500	18700		2 Wn.	78	Own	4 Opp.
16		Aultman-Taylor	30	60	8-12	42 x 64	8000	23000		2 Wh.	90	Own	4 Opp.
17		Multipedal	5	10			750	950		2W or 2C		Le Roi	4 Ver.
18		Multipedal	12	20			2900	3500		2 Cr.		Buff.	4 Ver.
19	F. C. Austin Co., Inc., Chicago	Multipedal	15	30			2400	4500		2W or 2C		Asso.	4 Ver.
20		Multipedal	20	40	4		3200	10250		2 Cr.		Auto.	4 Ver.
21		Multipedal	25	50			4200	12500		2 Cr.		Buff.	4 Ver.
22		Multipedal	75	125			12500	24000		2 Cr.		Buff.	4 Ver.
23		Avery	5	10	2	Small		2150		2 Wh.	30	Own	4 Ver.
24		Avery	8	16	3	19 x 30		4900		2 Wh.	50	Own	2 Opp.
25	Avery Co., Peoria, Ill.	Avery	12	25	4	22 x 36		7500		2 Wh.	56	Own	2 Opp.
26		Avery	18	36	4	28 x 46		9250		2 Wh.	65	Own	4 Opp.
27		Avery	25	50	6	32 x 54		12500		2 Wh.	69	Own	4 Opp.
28		Avery	40	80	8-10	42 x 70		22000		2 Wh.	87 1/2	Own	4 Opp.
29	Bean Spray Pump Co., San Jose, Cal.	Track Pull	6	10	2		1125	3200	1,340	1 Cr.		Le Roi	4 Ver.
30	Beltrail Tractor Co., St. Paul, Minn.	Beltrail	12	20	2		2000	4500	1,600	1 Cr.		Wauk.	4 Ver.
31	C. L. Best Gas Tractor Co., San Leandro, Cal.	Best Tracklayer	20	40			11000	4,100		2 Cr.		Own	4 Ver.
32		Best Tracklayer	38	75				28000	5,750	2 Cr.		Own	4 Ver.
33	Bethlehem Motors Corp., Allentown, Pa.	Bethlehem	18	36	4	28 x 46	3100	6200		2 Wh.	54	Beav.	4 Ver.
34	Blumberg Mfg. Co., San Antonio, Tex.	Blumberg	9	18				2450	850	2 Wh.	40	Own	4 Ver.
35		Blumberg	12	24				3400	1,250	2 Wh.	40	Own	4 Ver.
36	Boring Tractor Corp., Rockford, Ill.	Boring		20				3550	1,485	2 Wh.	54	Wauk.	4 Ver.
37	Brillion Iron Works, Brillion, Wis.	Brillion	12	22	3	26	3000	4900		2 Wh.	60	Field	4 Opp.
38	Buckeye Mfg. Co., Anderson, Ind.	Trundaar	20	35	4		4000	9200		2 Cr.		Wauk.	4 Ver.
39	Buckeye Traction Ditcher Co., Findlay, Ohio	Buckeye 40	16	30				21000	5,500	2 Cr.		Auto.	4 Ver.
40		Buckeye 60	24	45				25000	6,500	2 Cr.		Auto.	4 Ver.
41		Creeping Grip	15	25			3000	7000	2,000	2 Cr.		Wauk.	4 Ver.
42	Bullock Tractor Co., Chicago	Senior	35	50			6000	18000	4,500	2 Cr.		Wauk.	4 Ver.
43		Giant	50	75			7500	20000	5,000	2 Cr.		Wauk.	4 Ver.
44		Case	10	18	2-3	20 x 28	2080	3400	1,225	2 Wh.	42	Own	4 Ver.
45	J. I. Case T. M. Co., Racine, Wis.	Case	10	20	3	20 x 36	2330	5050	1,325	2 Wh.	52	Own	4 Ver.
46		Case	15	27	3-4	26 x 46	3000	5600	1,600	2 Wh.	52	Own	4 Ver.
47		Case	20	40	5-6	32 x 54	4400	14050	3,000	2 Wh.	66	Own	2 Opp.
48	Chase Motor Truck Co., Syracuse, N. Y.	Chase	9	18				4700	1,200	2 Wh.	48	Buda	4 Ver.
49	Cleveland Tractor Co., Cleveland, Ohio	Cleveland	12	20	2		1500	3200	1,585	2 Cr.		Weid.	4 Ver.
50	C. O. D. Tractor Co., Minneapolis, Minn.	C. O. D.	13	25	3		2500	6500	1,395	2 Wh.	70	Own	2 Hor.
51	Coleman Tractor Co., Kansas City, Mo.	Coleman	16	30			2000		1,750	2 Wh.	44	Clim.	4 Ver.
52	Dart Truck & Tractor Corp., Waterloo, Iowa	Blue J.	15	30	3	24	3000	4500	1,750	1 Wh.	40	Buda	4 Ver.
53	Dauch Mfg. Co., Sandusky, Ohio	Sandusky J.	10	20	2-3	24	2000	4080	1,500	2 Wh.	48	Own	4 Ver.
54		Sandusky E.	15	35	4	32	3000	8000	2,500	2 Wh.	56	Own	4 Ver.
55	Dayton-Dick Co., Quincy, Ill.	Leader B.	12	18	2-3	24	2500	4800	1,000	2 Wh.	48	Own	2 Opp.
56		Leader C.	18	36	4-6	32	4000	6600	2,250	2 Cr.		Twin	4 Ver.
57		Capital 20	20					12000	3,000	2 Wh.	53	Own	2 Opp.
58	C. H. A. Dissinger & Bro. Co., Wrightsville, Pa.	Capital 30	30					14000	4,000	2 Wh.	60	Own	2 Opp.
59		Capital 45	45					16000	4,400	2 Wh.	66	Own	2 Opp.
60		Capital 75	75					24000	6,000	2 Wh.	84	Own	2 Opp.
61	Eagle Mfg. Co., Appleton, Wis.	Eagle F.	12	16	3	26	2400	5900	1,522	2 Wh.	48	Own	2 Hor.
62		Eagle	22	30	4	32	3700	7050	1,853	2 Wh.	52	Own	2 Hor.
63	Electric Wheel Co., Quincy, Ill.	Alwork	14	28	3	28	3000	5000	1,460	2 Wh.	48	Own	4 Ver.
64	Elgin Tractor Corp., Piqua, Ohio	Elgin B.	9	18			1600	2900	1,075	2 Wh.	42	Buda	4 Ver.
65		Elgin E.	10	20	3	20	2000	3300	1,385	2 Wh.	42	Ruten.	4 Ver.
66		E-B 12-20 AA	12	20	3	24	2500	4355		2 Wh.	54	Own	4 Ver.
67		E-B 9-16	9	16	2	18	1500	4260		2 Wh.	54	Own	4 Ver.
68	Emerson-Brantingham Co., Rockford, Ill.	E-B 12-20	12	20	3	24	2000	6500		2 Wh.	60	Own	4 Ver.
69		E-B 20-35	20	35	4-6	30	3000	9700		2 Wh.	72	Own	4 Ver.
70		E-B 40-65	40	65	8-10	44	10000	23000		2 Wh.	90	Own	4 Ver.
71	Evans Mfg. Co., Hudson, Ohio	Evans K.	20	35	4	32	3500	5500	1,955	2 Wh.	60	Buda	4 Ver.
72	Fageol Motors Co., Oakland, Cal.	Fageol	10	18	2		1000	3000	1,500	2 Wh.	48	Over.	4 Ver.
73	Farm Horse Traction Works, Hartford, S. D.	Farm Horse	16	34	3	28		4950	1,485	2 Wh.	48	Clim.	4 Ver.
74		Farquhar	15	25	3-4	27	2500	6000		2 Wh.	54	Buda	4 Ver.
75	A. B. Farquhar Co., Ltd., York, Pa.	Farquhar	18	35	4-5	30	3600	16000		2 Wh.	84	Own	4 Ver.
76		Farquhar	25	50	6-7	33	5000	19000		2 Wh.	84	Own	4 Ver.

Abbreviations: **Traction**—Wh., wheel; Cr., crawler. **Engine**—Beav., Beaver; Veer., Veera; Herc., Hercules; Wauk., Waukesha; Buff., Buffalo; Asso., Associated Manufacturers; horizontal; Opp., opposed. **Fuel**—G., gasoline; K., kerosene; D., distillate. **Carburetor**—Ray., Rayfield; King., Kingston; Holl., Holley; Scheb., Schebler; Ben., Bennett; Web., Holl., Holley. **Magneto**—A-K, Atwater Kent; Sum., Sumter; Eise., Eiseemann; Berl., Berling. **Clutch**—B & B., Borg & Beck; Bier., Bierman; Mun., Muncie; Rock., Rockwood; jaw clutch. **Final drive**—S. G., spur gear; G., gear; Ch., chain. **Drive**—Op., open; In., inclosed.

Auto.,  
Webster,  
McC., sp

# and Their Technical Specifications

Line No.	Bore and stroke	Normal R. P. M.	Fuel	Make and size of carburetor	Make of air cleaner	Make of magneto	Make of clutch	Make of gearset	Gearset type	Belt pulley diameter	Belt pulley R. P. M.	Belt speed F. P. M.	Speeds forward	Speed range, M. P. H.	Recommended plowing speed	Final drive	Drive	Furrow wheel	Line No.
1	4 1/2 x 6	850	G-K	1 1/2-King.	.....	K-W	Own	.....	Sl. G.	14	900	3300	2	2 1/4-3 1/8	2 1/2	S. G.	Op.	.....	1
2	4 1/2 x 6	850	G-K	1 1/2-King.	.....	K-W	Own	.....	Sl. G.	14	990	3300	2	.....	2 1/2	S. G.	Op.	.....	2
3	.....	375	G-K	.....	.....	Web.	Own	.....	Ch.	14-18	950	.....	1	.....	2 1/4	Ch.	Op.	.....	3
4	6 x 8	560	K-D	2 1/4-Own	Donal.	Bosch	Own	.....	.....	19	560	2790	2	2.1-3.26	2.1	S. G.	In.	No	4
5	7 x 8 1/2	530	K-D	2 1/4-Own	Donal.	Bosch	Own	Own	Sel. G.	23	530	3190	2	2.1-3	2.1	S. G.	In.	No	5
6	8 x 10	450	K-D	3 1/4-Own	Donal.	Bosch	Own	Own	Sel. G.	26	450	3060	2	2-3.2	2	S. G.	In.	No	6
7	10 x 12	375	K-D	3 1/4-Own	.....	Bosch	Own	.....	.....	36	375	3540	1	1.9	1.9	S. G.	Op.	No	7
8	4 3/4 x 6 1/2	830	G-K	.....	Ben.	.....	Own	Own	Sel.	15	.....	2600	2	2.3-2.8	2.3	S. G.	In.	Yes	8
9	5 1/4 x 7	720	G-K	1 1/2-King.	Ben.	K-W	Own	Own	Sel. G.	14 1/2	720	2600	1	2.3	2.3	S. G.	Op.	Yes	9
10	3 1/2 x 4 1/2	1000	G	.....	Ben.	.....	B. & B.	Own	.....	10	1000	2600	.....	1 1/2-2.8	2.3	S. G.	Op.	Yes	10
11	4 x 5	1000	G	1 1/2-Krice	.....	Bosch	Own	.....	Fr.	12	890	2500	3	.....	2 1/4	Ch.	Op.	Yes	11
12	4 1/4 x 5 1/4	1050	G-K	1 1/4-Scheb.	Ben.	Bosch	B. & B.	.....	Sl. G.	12	825	2600	2	2-3 1/2	.....	G.	Op.	Yes	12
13	4 3/4 x 6 1/4	900	G-K	.....	.....	Bosch	Own	Own	S. G.	20	450	2250	1	2.25	.....	S. G.	Op.	Yes	13
14	5 x 8	600	G-K	1 1/4-King.	.....	Bosch	Own	Own	S. G.	20	600	3100	2	2.13-2.93	2.93	S. G.	Op.	No	14
15	6 x 9	500	G-K	2 -King.	.....	Bosch	Own	Own	S. G.	24	500	3100	1	2.28	2.28	S. G.	Op.	No	15
16	7 x 9	500	G-K	2 1/2-King.	.....	Bosch	Own	Own	S. G.	24	500	3100	1	2.2	2.2	S. G.	Op.	No	16
17	2 1/2 x 4 1/2	1000	G-K	.....	Orem	K-W	Own	.....	.....	6	1440	2600	1	2 1/2	.....	.....	.....	Yes	17
18	4 x 5	1000	G-K	.....	Orem	K-W	Own	.....	.....	8	1300	2600	2	2 1/2-3 1/2	.....	.....	.....	No	18
19	4 1/4 x 6	900	G-K	.....	Orem	K-W	Own	.....	.....	9 1/2	965	2600	2	1 1/2-3 1/2	.....	.....	.....	No	19
20	5 x 7	800	G-K	1 1/2-Ben.	Orem	K-W	Own	Own	Sel. G.	20	500	2600	2	1 1/2-3	2	G.	Op.	No	20
21	6 x 7 1/2	750	G-K	.....	Orem	K-W	Own	.....	.....	20	500	2600	2	1 1/2-3	.....	.....	.....	No	21
22	7 1/2 x 9	550	G-K	.....	Orem	K-W	Own	.....	.....	20	500	2600	2	1 1/2-3 1/2	.....	.....	.....	No	22
23	3 x 4	1200	G-K	3/4-Zeph.	Ben.	A-K	Own	Own	Sl. Fr.	9	1000	2360	4	1-3	1 1/2	S. G.	Op.	No	23
24	5 1/2 x 6	600	G-K	1 1/4-King.	Ben.	K-W	Own	Own	Sl. G.	18	600	2830	2	1 1/2-3	1 1/2	S. G.	Op.	No	24
25	6 1/2 x 7	570	G-K	1 1/4-King.	Ben.	K-W	Own	Own	Sl. G.	19 1/2	570	2880	2	1 1/2-2 1/4	1 1/2	S. G.	Op.	No	25
26	5 1/2 x 6	650	G-K	1 1/4-King.	Ben.	K-W	Own	Own	Sl. G.	18	650	3000	2	2-3	2	S. G.	Op.	No	26
27	6 1/2 x 7	500	G-K	2 -King.	Ben.	K-W	Own	Own	Sl. G.	22	500	2880	2	2-3	2	S. G.	Op.	No	27
28	7 1/4 x 8	500	G-K	2 -King.	Ben.	K-W	Own	Own	Sl. G.	26	500	3400	2	1 1/2-2 1/2	2	S. G.	Op.	No	28
29	3 1/2 x 4 1/2	1200	D	1 -Mayer	Donal.	Bosch	Own	Own	S. G.	12	600	1900	2	1 1/2-2 1/2	1	G.	In.	.....	29
30	3 1/2 x 5 1/4	1000	G-D	1 -King.	Ben.	Dixie	.....	.....	Sl. G.	10	1000	2500	2	2 1/2-3 1/2	2 1/4	S. G.	Op.	Yes	30
31	6 1/4 x 6 1/4	600	D	1 1/2-Ens.	Ben.	Dixie	Own	Own	Sl. G.	.....	.....	.....	3	2 1/2	2 1/2	G.	In.	.....	31
32	7 1/4 x 9	435	D	2 -Ens.	Ben.	Dixie	Own	Own	Sl. G.	.....	.....	.....	3	2 1/2	2 1/2	G.	In.	.....	32
33	4 3/4 x 6	900	K	Strom.	Ben.	Bosch	.....	.....	Sl. G.	10	1278	.....	2	1.8-3.3	.....	S. G.	In.	.....	33
34	3 3/4 x 3 3/4	750	G	.....	Holl.	Dixie	.....	Foote	Sl. G.	10	600	1550	2	1-4	3	G.	In	Yes	34
35	3 3/8 x 5	750	G	1 1/4-Strom.	Holl.	Dixie	.....	Foote	Sl. G.	16	600	2480	2	1-4	3	G.	In	Yes	35
36	4 1/4 x 5 1/4	1000	G-K	1 1/4-King.	Ben.	King.	.....	.....	Sl. G.	10	435	1140	2	1-5	.....	Ch.	Op.	Yes	36
37	3 3/4 x 5	1000	K	1 1/4-King.	Own	Dixie	Bier.	Foote	Sl. G.	8	1000	2100	3	2-5	2	G.	Op.	No	37
38	4 1/4 x 6 1/4	950	G-K-D	1 1/2-Deppe	.....	Bosch	Own	Own	S. G.	10	950	2650	2	3.1-8	2 1/2	S. G.	In.	.....	38
39	6 1/4 x 8	500	G-K	1 1/2-Ben.	Ben.	K-W	Own	Own	G.	14	250	1000	4	3.1-8	.....	Ch.	Op.	.....	39
40	7 1/2 x 9	500	G-K	2 -Ben.	Ben.	K-W	Own	Own	G.	14	222	870	1	2 1/2	.....	Ch.	Op.	.....	40
41	4 3/4 x 6 1/4	900	G-K	1 1/4-Ben.	Ben.	Dixie	B. & B.	Own	Sl. G.	12	600	1875	3	1 1/2-3 1/2	2 1/4	.....	.....	No	41
42	5 1/2 x 7 1/2	850	G-K	.....	Ben.	Dixie	B. & B.	Own	Sl. G.	15	600	2250	3	1 1/2-3 1/2	.....	.....	.....	No	42
43	7 1/4 x 9 1/2	.....	G-K	.....	Ben.	Dixie	B. & B.	Own	Sl. G.	14	60	220	2	2 1/2-3 1/2	.....	.....	.....	No	43
44	3 3/8 x 5	1050	K	1 1/4-King.	Own	King.	Own	Own	Sl. G.	14 1/4	1050	3900	2	2 1/2-3 1/2	2 1/4	S. G.	In.	No	44
45	4 1/4 x 6	900	K	1 1/4-King.	Own	King.	Own	Own	Sl. G.	17	900	4000	1	2 1/2	2 1/4	S. G.	Op.	No	45
46	4 1/4 x 6	900	K	King.	Own	King.	Own	Own	Sl. G.	16	900	3762	2	2-3 1/2	2 1/4-3 1/2	S. G.	Op.	No	46
47	8 1/4 x 9	475	K	2 1/2-King.	.....	K-W	Own	Own	Sl. G.	24	475	2980	2	2-3	2	S. G.	Op.	No	47
48	3 3/4 x 5 1/2	900	G	1 1/4-Holl.	.....	King.	Bier.	Own	Sl. G.	8	900	1885	2	1 1/2-2 1/2	1 1/2	G.	Op.	No	48
49	3 3/4 x 5 1/2	1200	G-K	1 1/2-King.	Own	Eise	Own	B. & S.	S. G.	8	1200	2500	2	1 1/2-2 1/2	3 1/2	G.	In.	No	49
50	6 1/4 x 7	550	K	1 1/2-King.	.....	K-W	Own	.....	S. G.	18	530	2500	3	.....	.....	S. G.	In.	Yes	50
51	5 x 6 1/2	800	G-K	1 1/4-Strom.	Ben.	Dixie	B. & B.	.....	.....	12	800	2100	2	1 1/4-4	3	Worm	In.	Yes	51
52	4 1/4 x 5 1/2	1050	G	1 1/4-Zen.	Ben.	Dixie	Fuller	Own	Sl. G.	12	750	2355	3	1 1/4-6	2 1/2	.....	In.	No	52
53	4 1/4 x 5 1/4	985	G-K	1 1/4-King.	Ben.	Dixie	Own	Own	Sel. G.	10	975	2577	3	2-5	2-3	S. G.	Op.	Yes	53
54	5 x 6 1/2	750	G-K	2 -King.	Ben.	Dixie	Own	Own	Sel. G.	15	750	2945	2	2 1/4-3 1/2	3-4 1/2	S. G.	Op.	No	54
55	6 1/4 x 6	750	K	1 1/2-King.	Own	King.	Own	Own	Sel. G.	14	750	2750	2	1.8-3	1.8	G.	Op.	Yes	55
56	5 x 7 1/2	700	K	1 1/4-King.	Ben.	K-W	Own	Own	Sel. G.	14	700	2600	3	.....	1.8	Ch.	Op.	No	56
57	8 1/2 x 12	300	.....	.....	.....	.....	.....	.....	.....	36	300	.....	.....	.....	.....	.....	.....	.....	57
58	9 x 14	300	.....	.....	.....	.....	.....	.....	.....	36	300	.....	.....	.....	.....	.....	.....	.....	58
59	10 1/2 x 15	250	.....	.....	.....	.....	.....	.....	.....	40	250	.....	.....	.....	.....	.....	.....	.....	59
60	12 x 16	250	.....	.....	.....	.....	.....	.....	.....	40	250	.....	.....	.....	.....	.....	.....	.....	60
61	7 x 8	425	K	1 1/2-Linga.	.....	Dixie	Own	Own	Sl. G.	20	450	2250	2	2-3	2	G.	In.	Yes	61
62	8 x 8	425	K	2 -Linga.	.....	Dixie	Own	Own	Sl. G.	24	450	2678	2	2-3	2	G.	In.	Yes	62
63	5 x 6	800	K	1 1/2-King.	Ben.	King.	Own	Own	Sl. G.	12	800	2514	2	1 1/4-2.4	2.4	S. G.	In.	Yes	63
64	3 3/4 x 5 1/2	1000	G	.....	Own	King.	Own	.....	Fr.	9	1000	2360	7	.....	3 1/2	Ch.	In.	Yes	64
65	4 1/4 x 5 1/2	1000	G-K	.....	Own	King.	Own	.....	Fr.	10	1000	2600	1	.....	3 1/2	Ch.	In.	Yes	65
66	4 3/4 x 5	900	K	.....	Ben.	K-W	Own	.....	Sl. G.	12	900	2800	2	1.81-2.33	.....	G.	In.	No	66
67	4 1/4 x 4 1/2	800	K	1 1/4-Ben.	Ben.	K-W	Own	.....	Sl. G.	12	800	2500	2	1.72-2.33	.....	G.	In.	No	67
68	4 3/4 x 5	850	K	1 1/2-Ben.	Ben.	K-W	Own	.....	Sl. G.	12	708	2225	3	1.6-3.4	.....	G.	In.	Yes	68
69	5 x 7	700	K	1 1/2-Ben.	Ben.	K-W	Own	.....	Sl. G.	16	597	2500	2	1.7-2.26	.....	G.	In.	No	69
70	7 1/4 x 9	500	K	2 1/2-Ben.	Ben.	K-W	Own	.....	Sl. G.	22	500	2880	1	2	2	G.	In.	No	70
71	4 1/2 x 6	1000	G	1 1/4-Ray.	Holl.	Dixie	B. & B.	Own	Sel. G.	24	415	2600	2	2 1/4-4 1/2	2 1/2	G.	In.	Yes	71
72	3 3/4 x 5	1100	G-K	Till.	Own	Berl.	Own	Own	G.	6	.....	.....	2	2 1/2-2 3/4	2 1/2	G.	Op.	Yes	72
73	5 x 6 1/2	800	D	1 1/4-King.	Ben.	Dixie	Bier.	Own	Sl. G.	14	800	.....	2	1-4	3	Ch.	In.	No	73
74	4 1/2 x 6	900	G-K	1 1/2-King.	Ben.	K-W	Own	Nutt.	Sel. G.	14	800	2000	2	1-4	.....	G.	In.	.....	74
75	6 x 8	550	G-K	2 -King.	.....	K-W	Own	.....	.....	32	275	2300	2	1-2.3	.....	G.	Op.	.....	75
76	7 x 8	550	G-K	2 -King.	.....	K-W	Own	.....	.....	32	275	2300	2	1-2.3	.....	G.	Op.	.....	76

Auto., Automatic; Weid., Weidely; Clim., Climax; Twin, Twin City; Cont., Continental; Ruten., Rutenber; Over., Overland; Kenn., Kenneth. Cylinders—Ver., vertical; Hor., Webster; Zeph., Zephyr; Ens., Ensign; Strom., Stromberg; Till., Tillotson; Zen., Zenith; Cr., Carter; Perr., Perrin-Ingram. Air Cleaner—Donal., Donaldson; Ben., Bennett; Dec., special. Gearset—B. & S., Brown & Shreve; Nutt., Nuttall. Gearset type—Sl. G., sliding gear; Sel. G., selective gear; Fr., friction; Plan., planetary; Sl. J. C., sliding

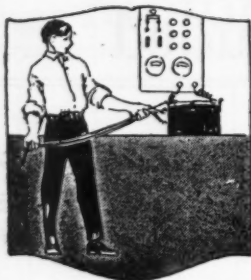
# Motor Age Monthly Guide to Tractors and

Line No.	Manufacturer	Tractor	Drawbar horsepower	Belt horsepower	No. plows recommended	Size separator recommended	Pounds pull drawbar	Weight	Price	Traction	Diameter drive wheels	Make of Engine	Cylinders
77	Henry Ford & Son, Inc., Dearborn, Mich.	Fordson	12	20	2		1800	2700		2 Wh.	42	Own	4 Ver.
78	Four Drive Tractor Co., Big Rapids, Mich.	Fitch	15	26	3	28	2200	5000	\$2,500	2 Wh.	42	Beav.	4 Ver.
79	Frick Co., Waynesboro, Pa.	Frick	12	25	3	27	3000	5800		2 Wh.	60	Erd	4 Ver.
80	Fulton Tractor Co., Anderson, Ind.	Fulton	10		2		2500	1,275		2 Wh.	56	Wauk.	4 Ver.
81	Gile Engine & Tractor Co., Ludington, Mich.	Gile Q.	18		4-5	36	3500	7000		2 Wh.	60	Own	4 Ver.
82	Gray Tractor Co., Minneapolis, Minn.	Gray	18	36	4	30	3750	6200	2,250	Drum	54	Wauk.	4 Ver.
83	Hart-Parr Co., Charles City, Iowa	New Hart-Parr	15	31	3	28	3000	5300	1,395	2 Wh.	52	Own	2 Hor.
84	Hession Tiller & Tractor Corp., Buffalo, N. Y.	Wheat	13	25			3000	4200	1,675	2 Wh.	48	Erd	4 Ver.
85	Hollis Tractor Co., Pittsburgh, Pa.	Hollis	15	25	3		3000	2750	1,375	2 Wh.	30	Light	4 Ver.
86	Holt Mfg. Co., Peoria, Ill.	Caterpillar	25	45			5000	13600		2 Cr.		Own	4 Ver.
87		Caterpillar	40	75			9300	25000		2 Cr.		Own	4 Ver.
88	Huber Mfg. Co., Marion, Ohio	Huber Light Four	12	25	3	22	2300	5000	1,285	2 Wh.	60	Wauk.	4 Ver.
89	Illinois Tractor Co., Bloomington, Ill.	C.	18	36	4	32		5000	2,150	2 Wh.	54	Clim.	4 Ver.
90	Imperial Machine Co., Minneapolis, Minn.	Imperial	40	70			7500	20800	4,500	2 Wh.	96	Own	4 Opp.
91	Indiana Silo Co., Anderson, Ind.	Indiana	5	10			1000	1700	900	2 Wh.	50	Le Roi	4 Ver.
92		Titan	10	20	3	24	1800	5700	1,225	2 Wh.	54	Own	2 Hor.
93	International Harvester Co., Chicago, Ill.	Mogul	10	20	3	24	1800	5500	1,125	2 Wh.	54	Own	1 Hor.
94		International	15	30	4	28	2350	9000		2 Wh.	66	Own	4 Ver.
95	Joliet Oil Tractor Co., Joliet, Ill.	Bates Steel Mule	12	20	3	28		4300		2 Cr.		Erd	4 Ver.
96	Kansas City Hay Press Co., Kansas City, Mo.	Prairie Dog	9	18	2		1500	3000	1,150	1 Wh.	48	Wauk.	4 Ver.
97	Keck-Gonnerman Co., Mount Vernon, Ind.	Keck-Gonnerman	12	24	3	24		6500	1,500	2 Wh.	61	Own	2 Hor.
98		Flour City Jr.	14	24	3			6800		2 Wh.	60	Own	4 Ver.
99	Kinnard & Sons Mfg. Co., Minneapolis, Minn.	Flour City	20	35	4-6			10000		2 Wh.	72	Own	4 Ver.
100		Flour City	30	50	6-8			14000		2 Wh.	84	Own	4 Ver.
101		Flour City	40	70	8-10			21000		2 Wh.	96	Own	4 Ver.
102	La Crosse Tractor Co., La Crosse, Wis.	Happy Farmer, F	12	24	3	24	2000	3800	1,150	2 Wh.	56	Own	2 Hor.
103		G.	12	24	3	24	2000	3800	1,250	2 Wh.	56	Own	2 Hor.
104	Lang Tractor Co., Minneapolis, Minn.	Lang	15	30			3600	4500	1,485	2 Wh.	50	Clim.	4 Ver.
105	Lauson, John, Mfg. Co., New Holstein, Wis.	Lauson	15	25	3-4	28		4000	1,895	2 Wh.	54	Beav.	4 Ver.
106	Leader Tractor Mfg. Co., Des Moines, Iowa	Rex	12	25	3	20-22	2400	5500	1,800	2 Wh.	60	Wauk.	4 Ver.
107	Leonard Tractor Co., Jackson, Mich.	Leonard	20	30	4	28	4000	5000	2,000	2 Wh.	50	Buda	4 Ver.
108	Lombard Auto Tractor Truck Corp., New York	Lombard					1900			2 Cr.		Own	6 Ver.
109	Liberty Tractor Co., Minneapolis, Minn.	Liberty	15	30				5775		4 Wh.	48	Clim	4 Ver.
110	Little Giant Co., Mankato, Minn.	Little Giant B.	16	22	3-4	26		5200	1,650	2 Wh.	54	Own	4 Opp.
111		Little Giant A.	26	35	5-6	32		8700	2,500	2 Wh.	66	Own	4 Opp.
112	Madison Motors Co., Anderson, Ind.	Bull	12	24	2-3	26	1900	5000	1,075	1 Wh.	72	Toro.	2 Opp.
113	Midwest Engine Co., Indianapolis, Ind.	Atlas	16	26			2800	5100	1,150	2 Wh.	66	Wauk.	4 Ver.
114		Twin City 12.	12	20	3	20	2000	4000		4 Wh.	50	Own	4 Ver.
115		Twin City 16.	16	30	4	24	3000	7800		2 Wh.	54	Own	4 Ver.
116	Minneapolis Steel & Machinery Co., Minneapolis, Minn.	Twin City 25.	25	45	6	32	4700	16000		2 Wh.	76	Own	4 Ver.
117		Twin City 40.	40	65	8-10	36	7500	23700		2 Wh.	84	Own	4 Ver.
118		Twin City 60.	60	90	12-15		11250	28000		2 Wh.	84	Own	6 Ver.
119	Moline Plow Co., Moline, Ill.	Moline Universal D.	9	18	2		2000	3300	1,500	2 Wh.	52	Own	4 Ver.
120		Lightfoot	6	10	1-2		1100	3200	1,250	2 Cr.		Kenn.	4 Ver.
121	Monarch Tractor Co., Watertown, Wis.	Neverslip M.	12	20	3	24	2200	6200	1,850	2 Cr.		Erd	4 Opp.
122		Neverslip N.	18	30	4	28	3300	7400	2,250	2 Cr.		Doman	4 Ver.
123	National Tractor Co., Cedar Rapids, Iowa	National E.	9	16	2	22	1800	3800	1,075	2 Wh.	46	Wauk.	4 Ver.
124		National F.	16	22	3	26	2250	4200	1,375	2 Wh.	46	Wauk.	4 Ver.
125	Nilson Tractor Co., Minneapolis, Minn.	Nilson Junior	16	25	3-4	24	3000	5000	1,775	2 Wh.	50	Wauk.	4 Ver.
126		Nilson Senior	24	36	4-5	30	4000	6400	2,475	2 Wh.	52	Wauk.	4 Ver.
127	Ohio Mfg. Co., Upper Sandusky, Ohio	Whitney	9	18	2	20	1600	3000	1,050	2 Wh.	48	Gile	2 Opp.
128	Parrett Tractor Co., Chicago	Parrett F.	12	25	3	24	2600	5200		2 Wh.	60	Buda	4 Ver.
129		Parrett H.	12	25	3	24	2600	5350		2 Wh.	60	Buda	4 Ver.
130	Peoria Tractor Corp., Peoria, Ill.	Peoria J.	12	25	3	24	3000	5100	1,985	2 Wh.	56	Clim.	4 Ver.
131	Pioneer Tractor Co., Winona, Minn.	F.	15	30	4	28		8500		2 Wh.	60	Own	4 Opp.
132		C.	30	60	10	36		23500		2 Wh.	96	Own	4 Opp.
133	Port Huron Engine & Thresher Co., Port Huron, Mich.	Port Huron	12	25	3	22	2200	5700	1,600	2 Wh.	56	Erd	4 Ver.
134	Rock Island Plow Co., Rock Island, Ill.	Heider D.	9	16	2	18	1500	4000	1,070	2 Wh.	54	Wauk.	4 Ver.
135		Heider C.	12	20	3	24	2000	6000	1,395	2 Wh.	57	Wauk.	4 Ver.
136	Royer Ensilage Harvester Co., Wichita, Kan.	Royer	12	25			2200	4600	1,225	2 Wh.	54	Erd	4 Ver.
137		Junior	12	24	2	18	2000	6200		2 Wh.	53	Wauk.	4 Ver.
138	Russell & Co., The, Massillon, Ohio	Little Boss.	15	30	3	24	3000	6900		2 Wh.	53	Wauk.	4 Ver.
139		Big Boss.	20	40	4	30	4000	7600		2 Wh.	60	Model	4 Ver.
140		Giant	30	60	8	40	8000	24000		2 Wh.	84	Own	4 Ver.
141	Short Turn Tractor Co., Bemidji, Minn.	Short Turn	30		3		5000		1,550	2 Wh.	51	Erd	4 Ver.
142	Square Turn Tractor Co., Norfolk, Neb.	Square Turn	18	35			3200	7800	1,875	2 Wh.	61	Clim.	4 Ver.
143	Stinson Tractor Co., Minneapolis, Minn.	Stinson	18	36	4	32	4750	6550		4 Wh.	60	Beav.	4 Ver.
144	Topp-Stewart Tractor Co., Clintonville, Wis.	B.	20	35	4-6	30	4500	6500	2,750	4 Wh.	42	Wauk.	4 Ver.
145	Turner Mfg. Co., Port Washington, Wis.	Turner-Simplicity	12	20	2-3	24	2300	4000	1,395	2 Wh.	54	Wauk.	4 Ver.
146		Turner-Simplicity	14	25	3-4	28	2600	4400	1,675	2 Wh.	54	Buda	4 Ver.
147	U. S. Tractor Co., Minneapolis, Minn.	U. S. B.	12	22			2000	3900	975	2 Wh.	60	Gile	2 Opp.
148		U. S. C.	18	30			3000	4100	1,450	2 Wh.	60	Erd	4 Ver.
149	Wallis Tractor Co., Racine, Wis.	Cub Junior	15	25	2-3	24	2000	3250	1,600	2 Wh.	48	Own	4 Ver.
150	Waterloo Gasoline Engine Co., Waterloo, Iowa	Waterloo Boy	12	25	3	24	2000	6000		2 Wh.	52	Own	2 Hor.
151	Wichita Tractor Co., Wichita, Kan.	A.	8	16	2-3		1500	3500	1,025	2 Wh.	60	Gile	2 Opp.
152	Wisconsin Farm Tractor Co., Sauk City, Wis.	E.	16	32	3-4	28	3500	5240	2,250	2 Wh.	52	Clim.	4 Ver.
153	Yuba Mfg. Co., Marysville, Cal.	Yuba Ball Tread	12	20			5000	6750	2,900	2 Cr.		Wauk.	4 Ver.
154		Yuba Ball Tread	20	35			5000	10250	4,700	2 Cr.		Wis.	4 Ver.
155	Zelle Tractor Co., St. Louis, Mo.	Zelle	12	25	2-3	24	2000	3800	2,000	2 Wh.	54		4 Ver.

Abbreviations: Traction—Wh., wheel; Cr., crawler. Engine—Beav., Beaver; Veer., Veerac; Wauk., Waukesha; Buff., Buffalo; Asso., Associated Manufacturers; Auto., Auto Opp., opposed. Fuel—G., gasoline; K., kerosene; D., distillate. Carburetor—Ray., Rayfield; King., Kingston; Holl., Holley; Scheb., Schebler; Ben., Bennett; Zeph., Zephyr; En., Atwater Kent; Sum., Sumter; Eise., Eismann; Berl., Berling. Clutch—B. & B., Borg & Beck; Bier., Bierman; Mun., Muncie; Rock., Rockwood; Spec., special. Gearset—B. & spur gear; G., gear; Ch., chain; R. P., roller pinion. Drive—Op., open; In., inclosed.

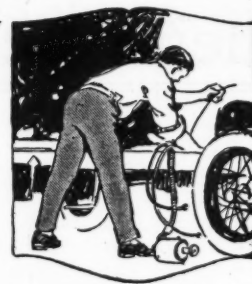
# Their Technical Specifications—Concluded

Line No.	Bore and stroke	Normal R. P. M.	Fuel	Make and size of carburetor	Make of air cleaner	Make of magneto	Make of clutch	Make of gearset	Gearset type	Belt pulley diameter	Belt pulley R. P. M.	Belt speed F. P. M.	Speeds forward	Speed range, M. P. H.	Recommended plowing speed	Final drive	Drive	Furrow wheel	Line No.
77	4 x 5	1000	K	Holl.	Own	Own	Own	Own	S. G.	9	1000	2500	3	1-15	2 1/2	Worm	In.	Yes	77
78	4 1/2 x 6	1000	G-K	1 1/4-King.	Ben.	Dixie	Mun.	Mun.	Sel. G.	14	710	2600	3	1-4	2 1/2	In.	In.	Yes	78
79	4 x 6	900	K	1 1/4-King.	Ben.	King.	Own	Nutt.	Sl. G.	13	900	3075	2	2.3-3.8	2.3	G.	Op.	Yes	79
80	3 1/2 x 5 1/4	1150	G-K	1-King.	King.	King.	Own	Fr.	Fr.	16	500	2100	2	1-15	2 1/2-3	Ch.	Op.	Yes	80
81	4 1/2 x 6 1/2	875	G	1 1/4-Ben.	Own	Dixie	Own	Own	Sl. G.	11	850	2600	2	2 1/2-3	2 1/2	G.	In.	No	81
82	4 1/2 x 6 1/2	850	G-K	1 1/2-Ben.	Ben.	K-W	Own	Own	Sl. G.	14	750	2750	2	1 1/2-3.8	3	G.	Op.	Yes	82
83	6 1/2 x 7	750	K	1 1/2-Scheb.	King.	K-W	Own	Own	Sl. G.	13	2600	2600	2	2 1/2-4	2-3	G.	Op.	Yes	83
84	4 x 6	1000	G-K	King.	Ben.	Dixie	Bier.	Own	Sl. G.	12	800	2400	2	1 1/2-7	2 1/2	G.	In.	No	84
85	3 1/2 x 4 1/2	1600	G-K	1 1/4-Zen.	Ben.	Dixie	Own	Own	Plan.	14	625	2290	2	2 1/2-3 1/2	2 1/2	G.	In.	No	85
86	6 x 7	600	G-D	1 1/2-King.	Donal.	K-W	Own	Own	Sl. J. C.	16	467	2649	2	2 1/2-3	2 1/2	Ch.	In.	No	86
87	7 1/2 x 8	550	G-D	2-King.	Donal.	K-W	Own	Own	Sl. J. C.	13	900	3063	2	2 1/2-4	2 1/2	G.	Op.	Yes	87
88	4 1/2 x 5 1/2	900	G-K	1 1/4-King.	Own	King.	Own	Own	S. G.	14	600	2250	2	1 1/2-3 1/2	2 1/2	G.	Op.	No	88
89	5 x 6 1/2	400	K	1 1/2-Strom.	Ben.	Dixie	Cotta	Foot	S. G.	30	400	3200	2	1 1/2-2 1/2	2 1/2	G.	Op.	No	89
90	7 1/2 x 9	400	G-K	2 -King.	Ben.	Dixie	Own	Own	S. G.	6	1200	1880	4	2.1-3.6	2 1/2	Ch.	Op.	Yes	90
91	3 1/2 x 4 1/2	950	G	1 -Scheb.	Ben.	A-K	Own	Own	Sl. G.	20	500	2000	2	1.8-2.5	2.5	Ch.	Op.	No	91
92	6 1/2 x 8	500	K-D	Own	Own	K-W	Own	Own	S. G.	20	400	2060	2	1.8-2.5	1.8-2.5	Ch.	Op.	No	92
93	8 1/2 x 12	400	K-D	Own	Own	K-W	Own	Own	S. G.	18	575	2800	2	1.8-2.4	2.4	Ch.	In.	No	93
94	5 1/2 x 8	575	K-D	Own	Own	K-W	Own	Own	S. G.	12	725	2300	2	2 1/2-4	2 1/2	G.	In.	Yes	94
95	4 x 6	900	G-K	1 1/4-Ben.	Ben.	Eise.	B. & B.	Own	Sl. G.	10	950	2500	2	2 1/2-6	2 1/2	G.	In.	Yes	95
96	3 1/2 x 5 1/2	950	G-K	1-Ben.	Ben.	Dixie	Own	Own	S. G.	16	650	2700	2	2-4 1/2	2 1/2	G.	In.	Yes	96
97	6 1/2 x 8	800	K	1 1/2-Scheb.	Ben.	K-W	Own	Own	Sl. G.	24	320	220	2	2.2-3.25	2 1/2	G.	In.	Yes	97
98	5 x 5	800	K	1 1/2-Scheb.	Ben.	A-K	Own	Own	Sl. G.	28	350	220	1	2 1/2	2 1/2	G.	In.	Yes	98
99	5 1/2 x 6	800	K	1 1/2-Scheb.	Ben.	A-K	Own	Own	Sl. G.	32	275	220	1	2 1/2	2 1/2	G.	In.	Yes	99
100	6 1/2 x 7	600	K	2 -Scheb.	Ben.	K-W	Own	Own	Sl. G.	34	275	220	1	2 1/2	2 1/2	G.	In.	Yes	100
101	7 1/2 x 8	450	K	2 -Scheb.	Ben.	A-K	Own	Own	Sl. G.	11	750	2100	1	2 1/2	2 1/2	G.	Op.	Yes	101
102	6 x 7	750	K	1 1/2-King.	Own	A-K	Own	Own	Sl. G.	11	750	2100	1	2 1/2	2 1/2	G.	Op.	Yes	102
103	6 x 7	750	K	1 1/2-King.	Ben.	A-K	Own	Own	Sl. G.	14	800	2600	2	2 1/2-5	2 1/2	Ch.	In.	Yes	103
104	5 x 6 1/2	650	G-K	1 1/4-Ray.	Ben.	Dixie	Own	Own	Sel. G.	18	475	2200	2	1 1/2-3	2 1/2	G.	In.	Yes	104
105	4 1/2 x 6	950	G-K	1 1/2-King.	Own	Dixie	Own	Nutt.	Sel. G.	12	900	2200	2	2 1/2-4	2 1/2	G.	In.	Yes	105
106	4 1/2 x 5 1/2	900	K	1 1/2-King.	Ben.	Eise.	Bier.	Own	Sel. G.	16	575	2400	2	1 1/2-4	2.6	G.	In.	No	106
107	4 1/2 x 6	1000	G-K	1 1/2-Zen.	Own	Dixie	Own	Own	Sel. G.	12	900	2600	2	2 1/2-4 1/2	3	Worm	In.	Yes	107
108	5 1/2 x 7	900	G	2 1/2-Any	Strom.	Dixie	Spec.	Spec.	Sel. G.	9	900	2100	3	1 1/2-6	3	G.	In.	No	108
109	5 x 6 1/2	900	K	1 1/4-King.	Own	K-W	Own	Own	Sl. G.	13	750	2500	3	1 1/2-6	3	G.	In.	No	109
110	4 1/2 x 5	750	K	1 1/2-King.	Own	K-W	Own	Own	Sl. G.	12	750	2350	1	2 1/2	2.4	G.	Op.	Yes	110
111	5 1/2 x 6	750	K	1 1/2-King.	Donal.	King.	Own	Own	Sl. G.	12	800	2512	2	2-3	2 1/2	S. G.	Op.	Yes	111
112	4 1/2 x 5 1/2	1000	G-K	1 1/4-H-S	Ben.	K-W	Own	Own	Sl. G.	16	650	2200	2	2.2-2.9	2-2 1/2	S. G.	In.	Yes	112
113	4 1/2 x 6	1000	K	1 1/2-King.	Ben.	K-W	Own	Own	Sl. G.	17	528	2400	2	2-2 1/2	2 1/2	S. G.	In.	No	113
114	5 x 7 1/2	650	G-K	2 -King.	Ben.	K-W	Own	Own	Sl. G.	20	600	3150	2	1.4-2	2 1/2	S. G.	Op.	No	114
115	6 1/2 x 8	600	G-K	2 -King.	Ben.	K-W	Own	Own	Sl. G.	23	500	2900	1	2	2 1/2	S. G.	Op.	No	115
116	7 1/2 x 9	500	G-K	2 1/2-King.	Ben.	K-W	Own	Own	Sl. G.	23	500	2900	1	2	2 1/2	S. G.	Op.	No	116
117	7 1/2 x 9	500	G-K	3 -King.	Ben.	K-W	Own	Own	Sl. G.	9	1200	2900	1	3 1/2	3-3 1/2	S. G.	In.	Yes	117
118	3 1/2 x 5	1800	G	1 1/4-Holl.	Ben.	Remy	B. & B.	Own	Sl. G.	750	500	2200	2	1 1/2-2 1/2	2 1/2	Ch.	Op.	No	118
119	3 1/2 x 4	900	G-K	1 -King.	Ben.	K-W	Bier.	Foot	Sel. G.	565	600	2200	2	1 1/2-2 1/2	1 1/2	Ch.	Op.	No	119
120	4 x 6	800	G-K	1 1/4-King.	Ben.	K-W	Bier.	Foot	Sel. G.	10	1000	2200	6	2-3 1/2	2-2 1/2	S. G.	In.	Yes	120
121	4 1/2 x 6	800	G-K	1 1/2-King.	Ben.	K-W	Own	Own	Sel. G.	10	1000	2200	6	2-3 1/2	2-2 1/2	S. G.	In.	Yes	121
122	3 1/2 x 5 1/4	1000	G-K	1 -Ben.	Ben.	Rock.	Own	Fr.	Fr.	20	400	1992	2	2 1/2-5 1/2	2 1/2	Ch.	In.	Yes	122
123	4 1/2 x 5 1/2	900	K	1 1/4-King.	Ben.	Eise.	Rock.	Own	Fr.	24	360	2160	3	2 1/2-5 1/2	2 1/2	Ch.	In.	Yes	123
124	4 1/2 x 5 1/2	900	G-K	1 1/2-King.	Ben.	K-W	Own	Own	Sel. G.	11	750	2100	3	1 1/2-4	2 1/2	Ch.	Op.	No	124
125	4 1/2 x 5 1/2	900	G-K	1 1/2-King.	Ben.	K-W	Own	Own	Sel. G.	12	1000	3140	2	2 1/2-4	2 1/2	S. G.	Op.	Yes	125
126	4 1/2 x 5 1/2	1000	K	1 1/2-King.	Own	Eise.	Own	Own	Sl. G.	12	1000	3140	3	1 1/2-4	2 1/2	S. G.	In.	Yes	126
127	4 1/2 x 5 1/2	1000	K	1 1/2-King.	Own	Eise.	Own	Own	Sl. G.	14	650	2450	2	2 1/2-4	2 1/2	G.	Op.	Yes	127
128	5 x 6 1/2	750	K	1 1/2-King.	Ben.	K-W	Own	Own	Sl. G.	14	750	2750	3	1 1/2-4	2 1/2	Ch.	In.	Yes	128
129	7 x 8	600	K	2 -King.	Ben.	K-W	Own	Own	Sl. G.	18	600	2700	3	1 1/2-4	2 1/2	S. G.	In.	No	129
130	4 x 6	900	G-K	1 1/4-King.	Ben.	King.	Own	Own	Fr.	14	1065	3900	6	1 1/2-4	2 1/2	S. G.	In.	Yes	130
131	4 1/2 x 5 1/2	800	G-K	1 -King.	Ben.	Dixie	Own	Own	Fr.	12	600	2200	7	1-4	2 1/2	S. G.	Op.	Yes	131
132	5 1/2 x 6 1/2	750	G-K	1 1/2-King.	Ben.	Dixie	Own	Own	Fr.	14	700	2200	7	1-4	2 1/2	S. G.	Op.	Yes	132
133	4 x 6	900	K	1 1/2-King.	Ben.	King.	Own	Own	Fr.	18	600	2828	2	2-3	2 1/2	Ch.	Op.	Yes	133
134	4 1/2 x 5 1/2	1000	K	1 1/4-King.	Ben.	Bosch	Own	Cotta	Sl. G.	12 1/2	915	3000	3	1 1/2-3 1/2	2 1/2	S. G.	Op.	Yes	134
135	4 1/2 x 6 1/2	950	K	1 1/4-King.	Ben.	Dixie	Own	Cotta	Sl. G.	12 1/2	810	2850	3	1 1/2-3 1/2	2 1/2	S. G.	Op.	Yes	135
136	5 1/2 x 7	825	K	1 1/2-King	Ben.	Dixie	Own	Own	Sl. G.	12 1/2	840	2749	2	2.4-3 1/2	2.4	S. G.	Op.	Yes	136
137	8 x 10	525	K	2 -King.	Ben.	Bosch	Own	Own	Sl. G.	24	525	3310	2	2-4 1/2	2 1/2	S. G.	Op.	Yes	137
138	4 x 6	900	K	1 1/2-King.	Ben.	Dixie	Own	Own	Sl. G.	12	900	2200	2	2-3 1/2	2 1/2	Ch.	Op.	No	138
139	5 x 6 1/2	850	G-K	1 1/2-Strom.	Ben.	Dixie	Own	Own	Sl. G.	12	850	1838	2	2-2 1/2	2 1/2	S. G.	In.	Yes	139
140	4 1/2 x 6	950	K	1 1/4-King.	Own	Dixie	Own	Own	Sl. G.	12 1/2	1200	3900	1	2-3 1/2	2 1/2	S. G.	In.	Yes	140
141	4 1/2 x 6 1/2	900	G	King.	Ben.	Eise.	B. & B.	Own	Sl. G.	14	600	2200	3	1 1/2-4	2 1/2	G.	In.	Yes	141
142	3 1/2 x 5 1/2	1000	K	1 1/2-King.	Ben.	Dixie	Own	Foot	Sel. G.	14	600	2030	2	1 1/2-3	1 1/2-2 1/2	R. P.	Op.	Yes	142
143	4 1/2 x 5 1/2	1000	K	1 1/4-King.	Ben.	Dixie	Own	Foot	Sel. G.	12	900	2200	2	2 1/2-2 1/2	2 1/2	G.	In.	Yes	143
144	5 1/2 x 6 1/2	850	G	1 1/2-King.	Ben.	Dixie	Own	Own	Sl. G.	12 1/2	1000	2200	2	2 1/2-5	2 1/2	G.	In.	Yes	144
145	4 1/2 x 5 1/2	900	G-K	1 1/4-Ben.	Ben.	K-W	Own	Own	Sel. G.	18	430	2030	2	2 1/2-3 1/2	2 1/2	S. G.	In.	Yes	145
146	6 1/2 x 7	750	K	1 1/2-Scheb.	Own	Dixie	Own	Own	Sl. G.	14	750	2750	2	2 1/2-3	2 1/2	S. G.	Op.	Yes	146
147	5 x 6 1/2	750	G	1 1/2-King.	Ben.	A-K	Bier.	Own	Sl. G.	12	750	2358	1	2 1/2	2 1/2	R. P.	Op.	Yes	147
148	5 x 6 1/2	800	K	1 1/2-Strom.	Ben.	Eise.	B. & B.	Foot	Sl. G.	16	575	2660	2	1 1/2-4	2 1/2	S. G.	Op.	Yes	148
149	4 1/2 x 6 1/2	700	D	1 1/4-Ens.	Donal.	Bosch	B. & B.	Own	Sl. G.	12	700	2200	3	1.5-4	2.08	.....	.....	No	149
150	5 1/2 x 7	700	D	1 1/2-Strom.	Donal.	Bosch	Own	Own	Sl. G.	Opt.	700	2200	2	2.06-3.28	2.06	.....	.....	No	150
151	4 1/2 x 5 1/2	900	K	1 1/4-Car.	Ben.	Bosch	Own	Own	Sel. G.	12	800	2500	4	1-5	2 1/2	S. G.	In.	No	151



# Electrical Equipment of the Motor Car

*By David Penn Moreton & Darwin S. Hatch.*



*Editor's Note—Herewith is presented the 134th installment of a weekly series of articles begun in MOTOR AGE, issue of June 29, 1916, designed to give the repairman and motorist the knowledge which will enable them to care for and repair any and all of the electrical features of the car, no matter what make or model it may be.*

*The first half of this series has been published in book form by the U. P. C. Book Co., Inc., 243-249 West Thirty-ninth street, New York, and is sold at \$2.50. The remainder of the series will be published as a supplementary volume.*

## Part CXXXIV—Bijur Electrical Systems

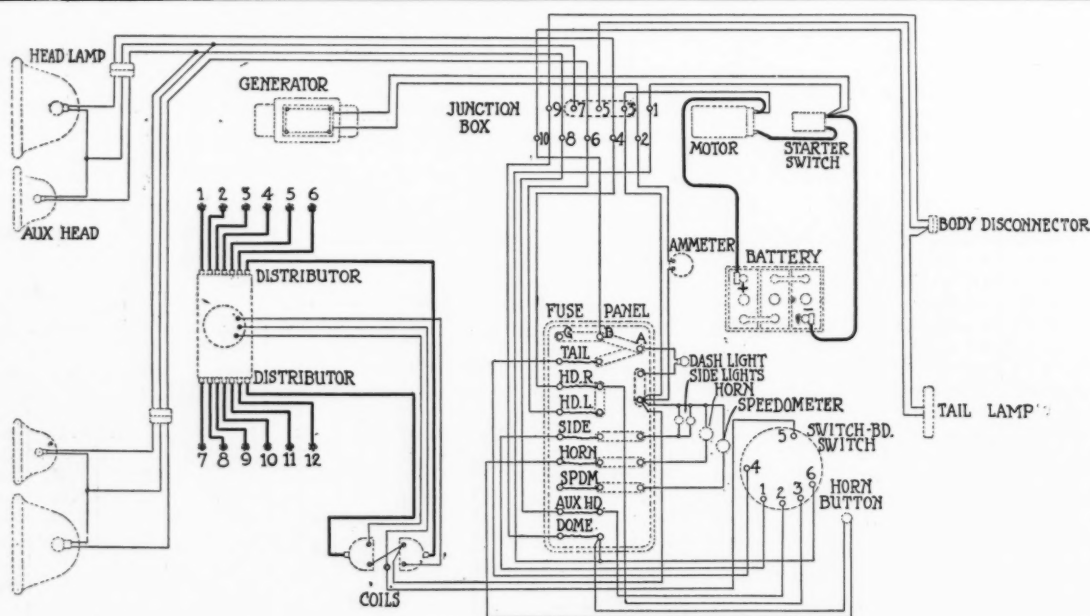


Fig. 680—Wiring diagram of Bijur installation on 1917 Packard, with Delco ignition

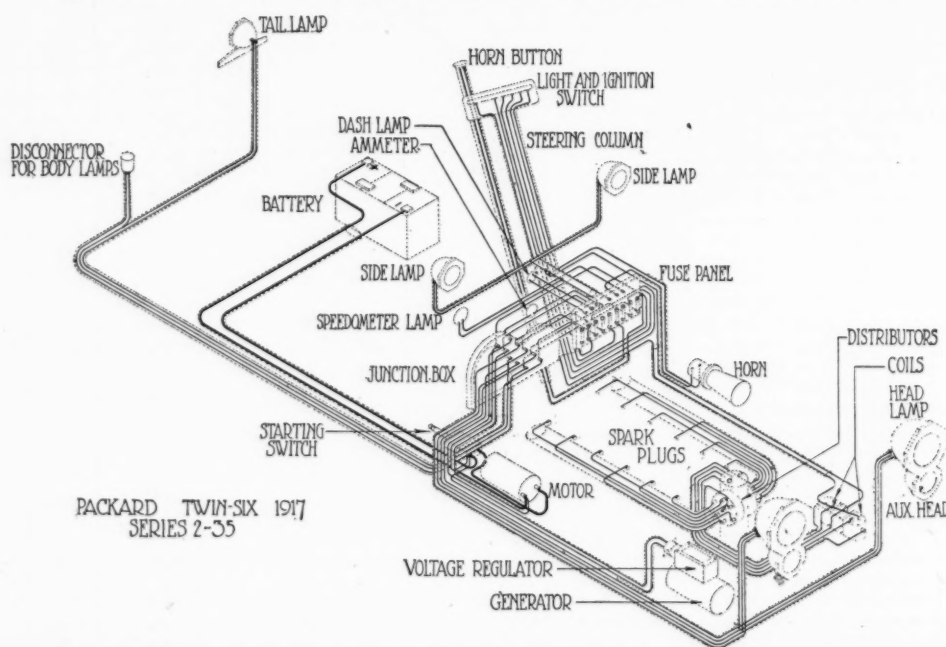


Fig. 681—Perspective view of Bijur installation on 1917 Packard, with Delco ignition

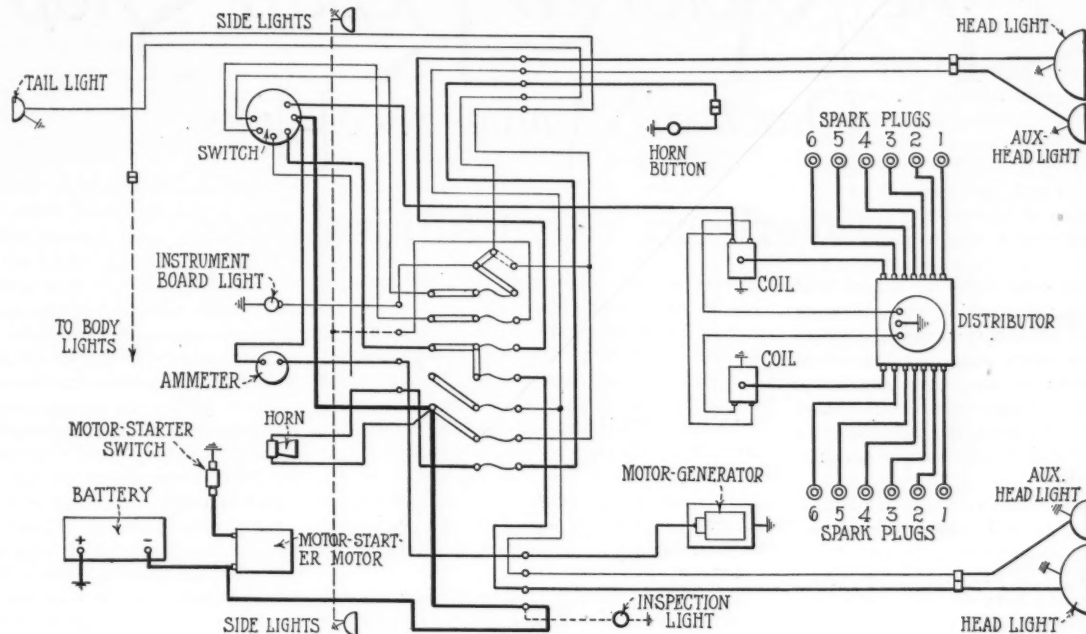


Fig. 682—Wiring diagram of Bijur installation on 1918 Packard Twin-Six

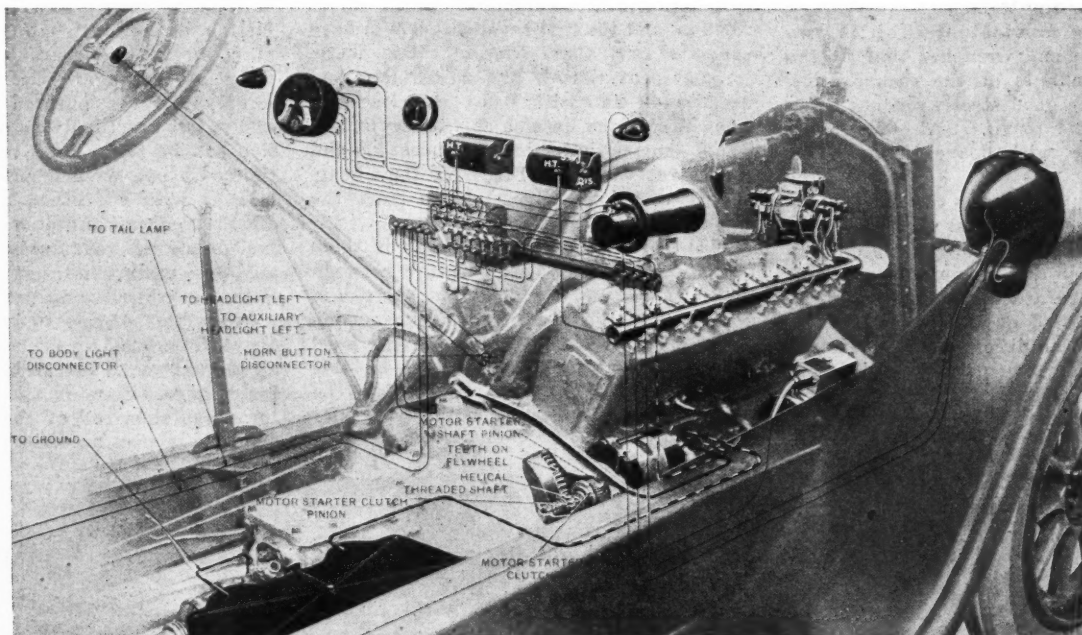


Fig. 683—Perspective view of Bijur installation on 1918 Packard Twin-Six

**A** WIRING diagram of the various electrical connections of the Bijur system on the Packard 1917 twin-six is given in Fig. 680, and a perspective view of the complete electrical installation is given in Fig. 681. This is a three-unit, two-wire, 6-volt system. The output of the generator is regulated by a constant-voltage regulator. This regulator and the automatic electromagnetic cutout are inclosed in a box mounted on top of the generator.

A junction box is provided on the front of the dash, where all the wires leading to the different lights are connected. Fuses are provided in all the light circuits and also the horn circuit. They are mounted in a panel on the engine side of the dash. The lighting and ignition switch is of special construction and is mounted on the steering column.

The ignition system, which is made by Delco, is of the battery

type, and separate high-tension distributors are provided for each cylinder block. A twin interrupter, on top of the distributor unit, completes the low-tension circuit when the interrupter points are in contact. A separate ignition coil is used for each of the interrupters.

#### Bijur on 1918 Packard Twin-Six

A wiring diagram of the Bijur electrical installation on the 1918 Packard Twin-Six is given in Fig. 682, and a perspective view of the complete installation is given in Fig. 683. This system is a two-unit, single-wire, 6-volt installation. The general layout of the system is the same as that used on the 1917 cars, except for the construction of the ignition and lighting switch. It is mounted on the dash instead of on the steering column.

# The Motor Car Repair Shop

## Practical Maintenance Hints

### Overhead Valve Adjustments

It has long been considered an axiom that the overhead valve with its more or less complicated actuating mechanism was necessarily more noisy than the T-head or L-head arrangements, and this is true of the earlier types. However, with the later designs and constructions the noise can be practically eliminated by proper adjustment of the parts.

If all the contacting surfaces are hardened properly, they will also stay in adjustment as long as any other poppet valve mechanism. If they are not very hard, the slight clearance between the parts becomes rapidly greater due to the hammering action of the cams, which can be compared to the action of a swaging machine or a pneumatic riveter. In this case no amount of adjustment will silence the valve gear.

Before attempting to adjust the valve it is necessary to provide oneself with two small thin open-end wrenches that fit the screws and locknuts of the rocker arms. These should be good steel wrenches hardened and ground to size. Also provide a thickness gage with leaves from 0.001 in. up.

These instructions apply to that type of overhead valve wear that is used mostly on motor car engines in which the camshaft is in the crankcase and a cam follower and long pushrod operate the valve through a rocker arm pivoted on top of the engine. There are several different arrangements of this type of valve gear, the principal ones being as follows:

1—Pushrods exposed on the side of the cylinder.

2—Pushrods inclosed in the cylinder casting or an extension of same.

3—The rocker arm bearing, fulcrum, is nearer the valve stem than the pushrod.

4—The rocker arm bearing is nearer the pushrod than to the valve stem.

These differences of design affect the amount of clearance that is necessary. If we could operate with no clearance at all, the engine would be dead quiet. Excessive clearances give us the familiar threshing machine effect and cause rapid wear at all points of contact.

Always adjust the valve gear when the engine is cold if it has the first type of rods. With the second it may be warm, say 150 deg. Fahr., but should not be hot. The reason is this: If the temperature of the room is 60 deg. and the engine is run until the water is at 200 deg. the average cylinder will have expanded upward about 0.008 in. and the first type of rods will have expanded only about 0.004 in. It is, therefore, evident that if the adjustment had been made hot with 0.001 in. clearance, when the engine became cold the cylinders would shorten more than the pushrods and the valves would be lifted off their seats and it would be impossible to start the engine.

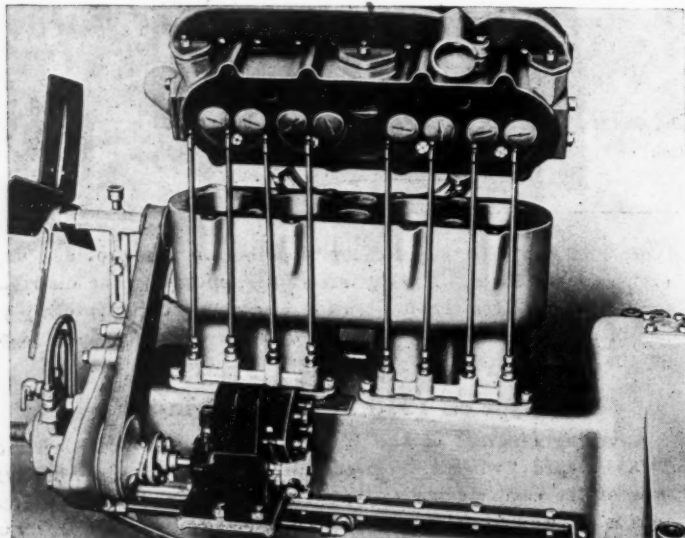
With the second type of pushrods there is little difference of temperature between the cylinders and the rods, but there is a difference in the amount of expansion between the cast-iron cylinder and the steel pushrod—about 0.0006 in. average—but this is negligible and is further corrected by the pushrod being normally slightly cooler than the cylinder.

The fourth type of rocker arm will allow of much closer adjustment, that is, less clearance than the third type, for the reason that the valve spring has a 2 to 1 leverage over the various oil films in the joints of the valve gear and will close the valve even if the clearance should be entirely wanting to the touch.

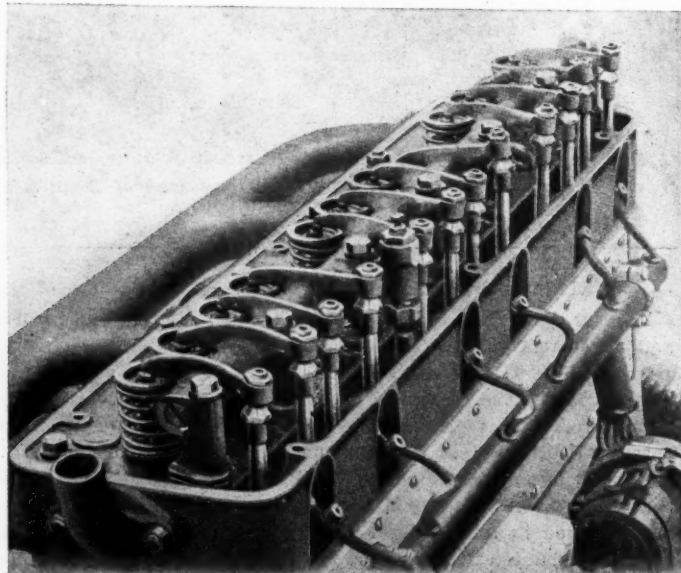
With some types of cupped pushrod, or rocker ends, the thickness gage, or feeler gage, cannot be used, and touch must be relied upon to get the right clearance. It is also desirable to have these parts dry and clean while adjusting and then lubricate them before running. Valves should be closed and rocker arms free before adjusting.

Suppose the engine has the first type of pushrods and fourth rockers. Loosen the locknut so the adjusting screw turns quite hard in the rocker arm. Screw in the adjusting screw until all the clearance is taken up and the pushrod cannot be twirled easily by the fingers. Now ease up on the screw until the pushrod can be twirled easily, but practically no up and down motion can be felt. Hold the screw in position with one wrench and tighten up the locknut with the other. After adjusting all the rockers and lubricating the ends feel of all the rods again and see if they all turn easily and have practically no clearance when the valves are closed.

When this engine is hot there will be about from 0.003 to 0.004 in. clearance on all the valves. This can be tested with the feeler gage either on the pushrod end or the valve stem end of the rockers, whichever one is most accessible.



Overhead valve arrangement in which pushrods are exposed on the side of the cylinder



Overhead valve arrangement in which the pushrods are inclosed in the cylinder casting or its extension

With the first type of pushrods and third type of rockers, the procedure is the same except 0.001 in. initial clearance should be given. This can be determined with the feeler gage or by adjusting the screw until an up and down motion of the rod can be barely felt. A thousandth of an inch is a perceptible quantity, especially to the touch.

With the second type of pushrods and the fourth rockers allow 0.001 in. initial clearance. With the second type of pushrods and third rockers allow from 0.002 to 0.003 in. initial clearance.

From this it will be seen that the quietest valve gear of the pushrod type is the one having the rods and rockers wholly inclosed and having rockers of the fourth type.

The form of cam outline that goes with the fourth rocker also makes for silent operation. Good workmanship is also a very large factor in silent running, good design being assumed.

To get silent operation cut the clearance all you can. If the engine will start and run cold, it will have plenty of clearance when it is hot.

## Handy Oil Filler

An oil filler can with a long rubber hose or flexible metal tubing attached to its spout will be found of great service in reaching out-of-the-way oil filler openings. At the same time the presence of the hose does not interfere seriously with its ordinary use.

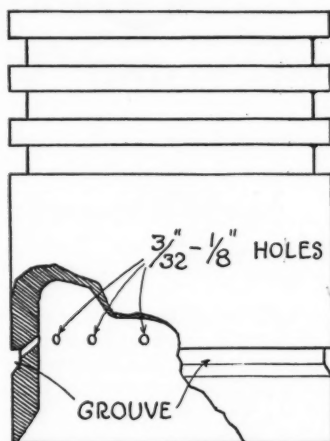
## Clutch Facing Jig

A jig such as shown is extremely useful in countersinking the rivet holes in a new leather. After the new facing is in place and the holes for the rivets have been bored in it the jig is used. Its feature is a set screw which may be adjusted to any position and locked there, thus limiting the depth to which the drill enters the facing.

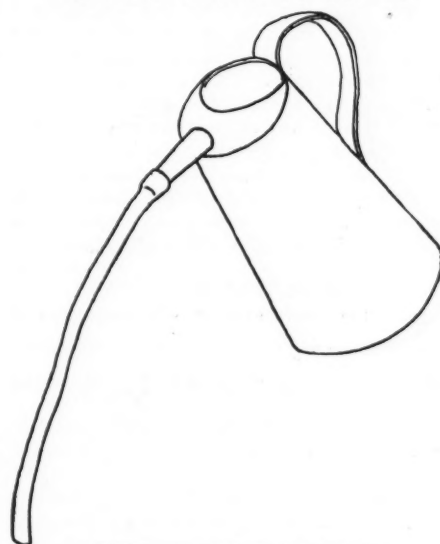
## Cylinders and Economy

Economy demands that the cylinder compression be kept up to normal. Low compression means loss of power and therefore greater fuel consumption. Whether the compression is good or not may be determined by cranking the engine over slowly, noting whether the pressure in that cylinder holds or leaks out gradually, as determined by the resistance to the pull of the crank handle. For the beginner it

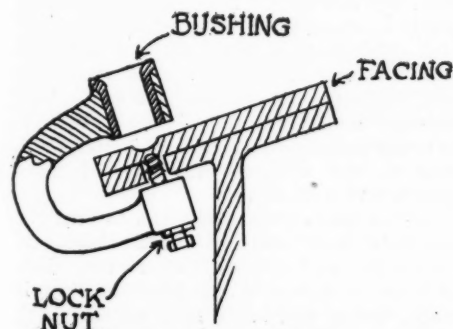
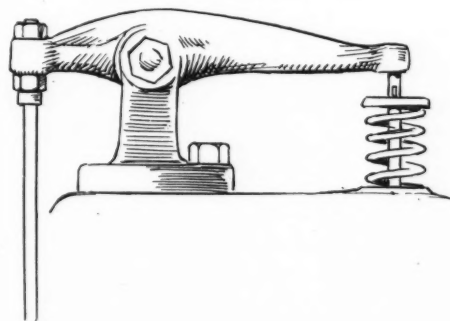
is advisable to open all the compression cups but the one on the cylinder being tested as a more clean-cut indication is given under these circumstances.



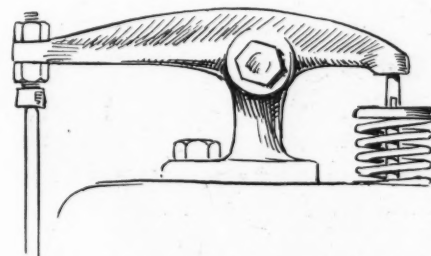
Suggestion for overcoming plug fouling



Oil filler can with flexible tubing



Suggestion for clutch facing jig



Overhead valve arrangements in which the fulcrum is nearer to the pushrod than the valve stem, above, and in which it is nearer the valve stem, below

Lack of compression is usually due to a leaky exhaust valve, and this in turn is caused by carbon on the valve or pit holes or both. If the condition is very bad the valve must be ground, but if only a small particle of carbon is causing the trouble the clearance between valve stem and pushrod should be increased until it is somewhere between  $\frac{1}{32}$  and  $\frac{1}{16}$  in. and the engine operated this way for two or three days, or until the carbon is pounded off.

A leaky valve might also be due to no clearance between valve stem and pushrod, this condition preventing the seating of the valve. Care should be taken in adjusting this clearance to see that it is not too small, otherwise the valve may not close properly, thus allowing a leak of more or less importance to start with, but, what is worse, the leakage of hot gas burns the valve and seat so that regrinding is soon necessary.

Leaky valves may be indicated by loss of power or, in very bad cases, by missing.

## To Stop Plug Fouling

When an engine starts to pump oil and the spark plugs become fouled, it is not always the best and cheapest plan to fit new rings. A good method to overcome spark plug fouling from the oil which leaks through and one that does not require the fitting of new rings is given herewith.

The piston is taken out and centered up in the chuck of a lathe and a groove is cut in its skirt of the piston. Then eight or ten holes are drilled at equal spaces around the periphery of the piston. These holes are drilled at the top of the groove and at an angle so they point upward and inward. This groove will serve as a wiper of the excessive oil and the holes will drain the groove and, because of their direction, will tend to lubricate the wristpin and the rod.

## Keeping Battery Charged

The man who has trouble keeping his battery charged will find that this difficulty largely can be overcome by careful handling. In other words, he should economize on current. He should keep his engine tuned up so that it starts on the second or third turn. Thus he can minimize the amount of current used in starting, and, remember, this is very large. The current required is 200 to 600 times as much as required by an ordinary 16-cp. house light.

He should also be economical with his lights. He should use his headlights only when absolutely necessary.

He should determine the car speed at which his cut-out relay makes connection with the battery and operate the car as much as possible above this speed.

If he drives much in a congested city district and stops his engine many times, he will find that his battery can be kept more nearly charged by changing gears in traffic whenever necessary instead of trying to do it all on high gear, the reason being that by changing gears he boosts his engine speed so that his battery is charged, while if he tries to pull slowly on high he gets down to a speed at which charging stops due to the opening of the cut-out.

# The Readers' Clearing House

## Questions and Answers

Conducted by B. M. Ikert

### Comparative Fuel Consumptions

Q—Which car takes the most gasoline, a 40-hp. four-cylinder or a 40-hp. six-cylinder car?—R. A. Yoost, Clark, S. D.

This question cannot be answered directly one way or the other. The writer, in a Buick D-45 which was put in an especially good condition for the purpose, was able to get 28 miles out of 1 gal. of gasoline, and a Ford also tuned up for the test could get 18 m.p.g. Theoretically, if the engines develop the same power, and are of the same design, the same cooling system and the power curve characteristics the same, the gasoline consumption must be the same. Practically, the six-cylinder engine will consume slightly more, because the intake manifold presents a greater area and consequent greater condensation of the gasoline.

### Using Ether in Gasoline

Cleveland, Ohio, Editor MOTOR AGE—Having used ether mixture for starting for over six years, I was attracted to the above heading in your issue of Jan. 20 and would like to correct some prevalent misconceptions in regard to its use.

Ether is not any more dangerous to handle than 75 gasoline but, like it, must not be handled in the presence of a flame.

It is volatile at all ordinary temperatures, which renders it very valuable for starting in very cold weather. The writer has used it for over six years for this purpose and never had the slightest trouble.

The heat of the hand will not cause it to explode, and the way to purchase it is in the tin cans that hold 1 lb. and is known as washed ether. The anesthetic ether can be used, but it is unnecessarily expensive. It need not be placed on ice before using.

One ounce of ether to 5 gal. of gasoline would have no effect whatever.

Ether has less heat units than gasoline, and as far as observation over six years

### Miscellaneous

goes it has no effect whatever on the engine.

I mix half ether and half gasoline and put it in a small tank and use a priming pump to squirt it in the intake manifold. The engine will start promptly no matter how cold the weather, which is a great saving on the battery and prevents running it down, as it is likely to do in cold weather. I have kept the tank on the car through the summer and the can of ether in my garage through the summer heat without loss or explosions.

At present I have the tank under the bonnet, where it gets quite warm. Possibly I have some loss of ether but it is not excessive, as one 1-lb. tin lasts me through the winter. A number of my friends also use ether this way with great satisfaction and no trouble.—E. T. Birdsall, M. E.

### Doble Steamer

Q—Is the Doble steamer still built, and if so, where and what is the price?

2—What do you think of the Doble, its principle and design?

3—What is the wheelbase of most racing cars?—John Fleming, Connorsville, Ind.

1—The Doble steamer is not in production, but the proposed car will cost about \$3,700.

2—The Doble steamer has many deserving features. It burns kerosene for one thing and the burners are of a very effi-

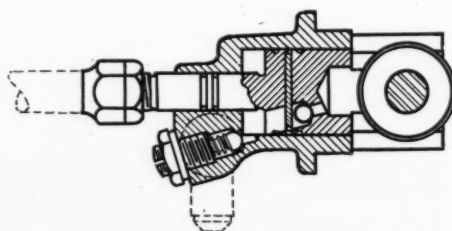


Fig. 2—Oil pump on the Chandler

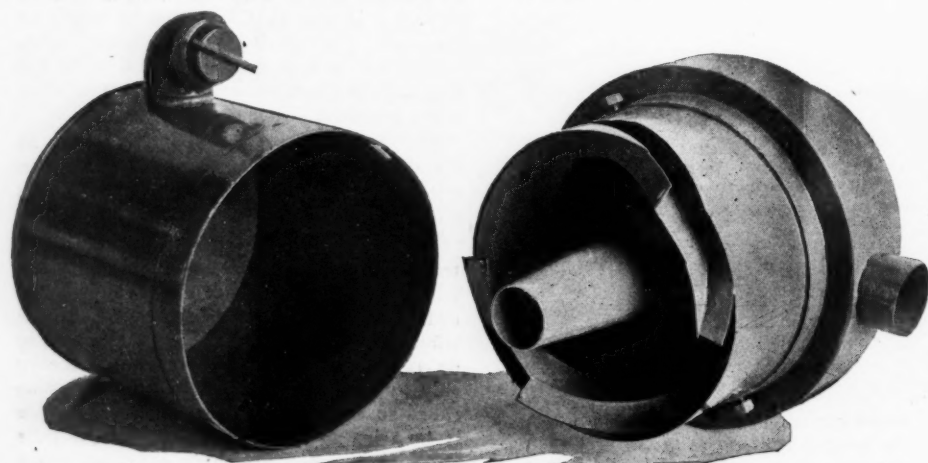


Fig. 1—Bennett centrifugal air cleaner which is used on tractors

cient type in that they burn at full blast or not at all depending upon the amount of steam that is up. Any steam car has the advantage over the gas car that no gears are necessary and the starting torque is nevertheless greater than the gas car. The steam engine can exert a torque effort while it is standing still but a gas engine is worse than dead when it is stopped because it must be first started at considerable expenditure of energy. This is common with all steam cars and applies to the Stanley as well as the Doble.

3—Racing cars have a wheelbase of 105 in. generally.

### Air Washer on Fordson

Q—Publish a cross-section of the air washer on the Fordson tractor and explanation of same.—Earl A. Bradley, Seattle, Wash.

The air cleaner on the Fordson Tractor is shown in Fig. 1. For a more complete description we refer you to the Oct. 17, 1918, issue of MOTOR AGE, in which the Wilcox Bennett air washer was illustrated and described.

### No. 18 Copper Wire

Q—How many feet are in a pound of copper 18-gage single-cotton insulated wire? Will it stand an ordinary 110 volt A. C. house lighting current?—Joe Tametich, Gary, Ind.

No. 18 wire runs 203.4 ft. to the pound.

Underwriters' rules do not allow use of single-cotton insulated wire on any 110-volt line, regardless of how small the current-carrying capacity is, even though a No. 18 wire will not blow out or melt in two until about 50 amp. are sent through it.

### General Car Questions

Q—Where is the best place to keep spare tires, in the cellar, or is it too damp there?

Q—Publish diagram of the oil pump on the 1918 Chandler.

3—What kind of oil should be used in this engine?

4—Give suggestions for heating this manifold.

5—Are Fords now again manufactured for civil use?

6—What is the price of same?

7—Would a Wilmo manifold or one similar be of much benefit to a Ford?

8—Would it not be a disadvantage in summer on account of the intense heat?

9—Have you had any experience with any of those devices?—C. F. Meier, Bouton, Iowa.

1—Tires can be kept in any place that is cool, dry and dark. A cellar does not generally conform to all these conditions.

2—This diagram is shown in Fig. 2.

3—Use an oil of flash point about 400 deg. or better, whose consistency is about that of "molasses in the summer time." It is being considered better and better practice to use a small quantity of flake graphite in with the oil.

4—We take it that you mean to heat the manifold itself and not the air before it enters the carbureter. This is very difficult to do unless a one-piece casting is made, which will serve as a housing both for the intake and the exhaust. The writer has seen some crude attempts at this with-

out making a one-piece casting, and as a result the exhaust gases leaked in great profusion and rendered repair a very difficult matter.

5—Yes.

6—The Ford costs \$525.

7—The Wilmo manifold shows a decided saving on fuel, regardless of what car it is applied to.

8—The Wilmo manifold heats the air and the gasoline together, that is, it is a device that treats the mixture. Heated air occupies more space than cold air, consequently not as much air admixed with gasoline is drawn into the cylinder per stroke as is the case when colder air is drawn in. This will decrease the power slightly but the fuel saved is an advantage.

9—Yes, in the conducting of tests to obtain data with regard to relative economy.

#### Bender Special Racer

In reply to Charles Richardson, Ellsworth, Ill., in *MOTOR AGE* last week it was stated that the Bender Special was not being manufactured. This is true but the company which sponsored it is not out of business. This car was a special racer built for and entered by the Ahlberg Bearing Co., Chicago.

#### To Cure Grabbing Clutch

Q—What can be done on a grabbing clutch on a Briscoe 4-38-1916 that has been soaked in castor oil for four days? Rivets are well countersunk.

2—Is there any spring device that can be put on to prevent the clutch from grabbing?

3—What causes a great deal of back lash in changing gears from second to high? It feels as though something was wobbling.—I. N. Hoyde, Lothair, Mont.

1—You should not have used castor oil for the clutch; neatsfoot oil is correct. It will be advisable to clean the clutch leather with kerosene, finishing with gasoline, and when dry use the neatsfoot oil. This operation should be made about three or four times a year. The oil will raise the fiber of the leather and permit it to engage easily.

2—As the clutch is made from thin metal there is not sufficient thickness to permit slots being cut to take in small springs. You can insert half a dozen pieces of rubber between the leather and the metal, and these will act as well as springs. They will have to be renewed occasionally, however. They should be about  $\frac{1}{4}$  in. wide,  $\frac{3}{8}$  in. thick and as long as the clutch leather is wide. By running a screwdriver under the leather it can be raised sufficiently to permit the pieces of rubber to be set in place.

3—Wear on the shifting forks probably causes this, together with play in all the connections from the gearshift lever to the forks. After tightening everywhere possible it will be necessary to put in new shifting forks if the play remains. This should be attended to at once, for otherwise the gears may not mesh to their full extent and in a hard pull or quick getaway you may strip the gears. It would not appear to be backlash from your description, but if it is, it will be necessary to look to the universal joints, pinion setting and condition of the differential gears and the driveshafts. Backlash can come from a small amount of play in any of these places. Usually it is a little in each. New bushings in the universal joint and setting the pinion closer to the ring gear will re-

TO assist readers in obtaining as a unit all information contained in this department on a certain subject *MOTOR AGE* segregates inquiries into divisions of allied nature. Questions pertaining to engines are answered under that head, and so on.

#### MISCELLANEOUS.

R. A. Yoost.....Clark, S. D.  
E. T. Birdsall.....Cleveland, Ohio  
John Fleming.....Connersville, Ind.  
Earl A. Bradley.....Seattle, Wash.  
Joe Tametich.....Gary, Ind.  
C. F. Meier.....Bouton, Iowa  
E. J. Becker.....Millville, Minn.  
I. N. Hoyde.....Lothair, Mont.

#### ENGINES

W. J. Baker.....Malta Bend, Mo.  
D. G. Wright.....Rock Island, Ill.  
R. H. Coven.....Elyria, Ohio  
R. A. Yoost.....Clark, S. D.  
J. C. Crandall.....Tabiona, Utah

#### THE ELECTRIC SYSTEM

Howard T. Dimick.....Shreveport, La.  
A. L. Burkholder.....Crofton, Ky.  
J. R. Kaupaun.....Buffalo, N. Y.  
F. E. Paulson.....Rosedale, Kan.  
F. W. Lincoln.....Brunswick, Ohio

#### CARBURETION

John R. Blake.....Rolling Prairie, Ind.  
A. A. M. Halvorson.....Webster, S. D.  
W. J. Baker.....Malta Bend, Mo.  
J. W. Dillon.....Bridgeport, Ohio

#### REBUILDING.

R. Mahoney.....Bisbee, N. D.  
Frank Swanson.....Claremont, S. D.  
H. E. McCabe.....Corning, Kan.  
W. M. Wigner.....Rostown, Sash.  
Earl Downs.....Chillicothe, Mo.

No communication without the writer's name and address will be answered in these columns.

move some and this is about all that can be done to overcome it. If it is in the differential, it may mean a new spider or even new gears.

## Engines

### Rattling Noise in Engine

Rock Island, Ill., Editor *MOTOR AGE*—Regarding the inquiry of C. W. Harter, Jr., of Hobart, Okla., in the Dec. 12 issue with reference to a rattling noise in the engine of a Dodge Brothers car when running at

a speed of 15 to 20 m.p.h., I have recently repaired two Dodge Brothers cars that had this trouble.

Remove the timing gearcase cover at the front of engine, remove the crankshaft timing gear and starter chain sprocket. Inspection of the long Woodruff key used to key these two gears to the crankshaft will show that it is worn considerable. Replace it with a new key, replace the gears, being careful to see that the engine is correctly timed, and carefully draw the nut up firmly against the gears to hold everything tightly in place. Care should be taken to see that the new key takes up all the play in the gears.—D. G. Wright.

### Patented Rings on Chalmers

Q—What are the width of the rings on the Chalmers 6-30 Duplex?

2—In putting in Inland rings would it be advisable to put on all these rings to a piston or just one or two?—W. J. Baker, Malta Bend, Mo.

1—The rings on the Chalmers Duplex 6-30 are  $\frac{1}{8}$ -in. wide.

2—There is considerable discussion these days relative to the installation of patented rings. Some automotive engineers recommend the installation of the old-style oblique slotted one-piece rings on the top side of the piston and a patented ring below. The reason is that the patented rings, being of more complicated structure than the old style ring, are more easily fouled, and the carbon is produced nearer to this ring than the other. This practice is being followed by several prominent manufacturers with much success.

### Bore and Stroke Query

Q—What is the bore and stroke of model 69 Overland?

2—What is the gear ratio of this car?

3—What is the weight of this car in a roadster?

4—What is the bore and stroke of the American Scout?

5—What is the bore and stroke of model 67 Overland?

6—What would a late model Zenith carburetor cost for an Overland 69?—R. H. Coven, Elyria, Ohio.

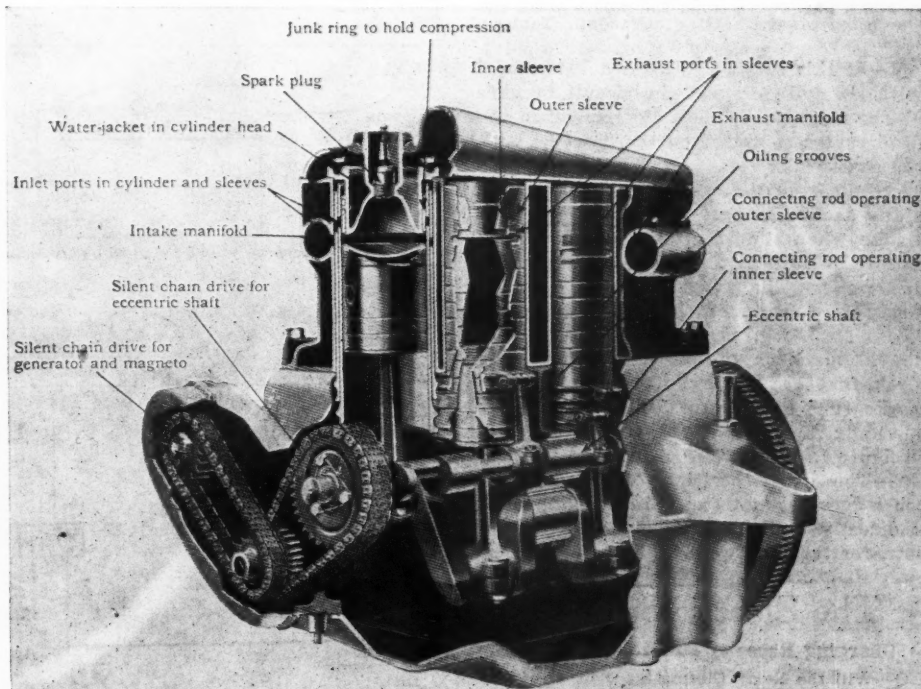


Fig. 3—Knight engine used in the Willys-Knight. That in the issue of Jan. 30 was another Knight engine and incorrectly called the Willys-Knight

1—The Overland 69 has a bore and stroke of 4 by 4½ in.

2—The gear ratio is optional.

3—The chassis weight is 1900 lb.

4—The American Scout bore and stroke is 4 by 5 in.

5—We have no record that would show a model 67 was ever manufactured. We believe you are misinformed on this car model.

6—A special device is needed to fit this carburetor to an Overland 69 and the total price of the device and the carburetor is \$24.60.

#### Straightening Crankshaft

Q—What is the proper way to straighten a four- or six-cylinder crankshaft?—R. A. Yoost, Clark, S. D.

Straightening a crankshaft is a job that only a shop equipped with the necessary machinery should undertake. This is particularly true of a six-cylinder shaft but is nevertheless important for a four-cylinder shaft. First, the shaft must be centered in a lathe, and the main bearings should be checked up with a self-registering gage. The tolerance allowed varies with the different cars, being less for an expensive car than one of the lower-priced. A Packard shaft is machined to 0.0002 in. above size, never under size. If the main bearings are all right, then the shaft should be centered for the crank throws in an offset chuck and checked up as before with a gage. Shafts sometimes can be straightened cold, but if the bend is too much, it should be heated to a dull red heat in an oil flame, and the corresponding webs of the shaft can be bent into the same plane and tested on a flat steel table.

#### National Timing and Setting

Q—My National roadster is car No. 2025, engine No. 8.N633. The date on the engine name plate is either 9-12-15 or 9-12-16. The marks on the flywheel are confusing to us. They are all single but one, which is double. Should these marks be directly under the terminal point when the engine is in position to fire?

2—Should the little carbon brush on the distributor be in the center of the brass lug leading to spark plug No. 1 when the points break and the magneto fires?—J. C. Crandall, Tabiona, Utah.

1—If this car is a 1915 or a 1916 model with six cylinders, set the circuit breaker of the magneto to open 1½ in. before top dead center measured on the flywheel with the spark fully retarded. The cams which operate the admission valves are set so the crank is 5 deg. past center on the down stroke when the valve opens and set for closure at 45 deg. past dead center on the up stroke. The exhaust valves open 55 deg. before center on the down stroke and closes at 5 deg. past upper center. The double mark is probably the beginning mark for the first cylinder. One of the marks runs clear across the whole width of the flywheel, and the other is an elongated figure 1.

2—The exact position of this carbon brush does not matter. It is better to have it directly in the center, as you say it is now, for then the wear is less.

## The Electric System

#### Charging Rates of Different Systems

Q—Will the Remy thermostat control of the generator charging rate used on the Oldsmobile 6, the Paige and other cars keep the battery at a higher rate of charge than systems not so equipped, other things being equal?

2—What number of amperes should be given

maximum by the average system to keep a battery to 1.250 or better in both cold and warm weather? Is the average system competent to do so?

3—What is the maximum amperage on the following systems: Delco, Westinghouse, Bijur, Dyneto and Auto-Lite?

4—At what speed per hour do the following cars attain their full horsepower? Apperson, Buick, Chandler, Dodge Brothers, Haynes, Hudson, National, Oldsmobile, Paige, Reo.—Howard T. Dimick, Shreveport, La.

1—All systems are designed to keep the battery charged and will do so if given the proper care. The thermostat control is just a means of performing the regulation and performs its duty as well as the other systems.

2—For ordinary city driving, where runs are not of such great length and starts more frequent, it is advisable to charge at a rate of 17 amp. The average system is designed to give a rate of this much.

3—These systems if necessary can generate as much as 30 amp. or slightly more, but this rate would be injurious to the bat-

tery. The controlling mechanism takes care of this, though, according to the adjustment.

4—MOTOR AGE has not this data. It would mean little, anyway. Rated horsepower is given at a certain number of revolutions per minute, or speed per hour, but this means nothing in actual practice as the stated number of revolutions seldom could be maintained, except possibly on a speedway.

#### Charging Storage Batteries

Q—Publish diagram of how to charge storage batteries from Delco-Light outfit.—A. L. Burkholder, Crofton, Ky.

This was shown on page 35 of MOTOR AGE for Jan. 30.

#### Charging Storage Batteries

Q—Publish diagram of wiring for charging motor car starting and lighting storage batteries with a Delco-Light.—J. E. Stockwell, Zenda, Kans.

This was shown in this department in issue for Jan. 30, on page 35.

#### Charging of Batteries

Q—Show how to make a charging board with lamp banks to charge a 6-, 12- or 18-volt storage battery from 32-volt farm lighting current. The 6-volt battery is a Willard with a start of 15 amp. I want to have this made so that any given number of amperes in this limit can be sent into the battery.

2—Show how to connect small motor car ammeter in battery line so as to show whether battery is charging or not, such as Weston, B. W. or something like that.

3—What causes the indicator on a Studebaker 1916 model 4 to show at 26 m.p.h. and over discharge with the lights on and when off swing back and forth rapidly. I am certain that nothing is the matter with the generator or battery, as both work well. When the lights are off everything is all right up to 30 m.p.h., then the same thing happens.—J. R. Kapaun, Buffalo, N. D.

1-2—A charging panel which the writer designed some years ago would seem to fit your case. This panel is shown in Fig. 4. A group of lamps is arranged on the board with switches that will allow of any or all of the fourteen lamps to be thrown in to the circuit. The storage battery is connected into the circuit at the binding posts as shown in the figure. The single-throw switch will enable the current to be shunted around the battery in case another battery is desired to be connected into the line without disturbing the charging lamps. It is not necessary to know the polarity of the charging wires when this board is used, because the ammeter immediately determines whether or not the battery has been

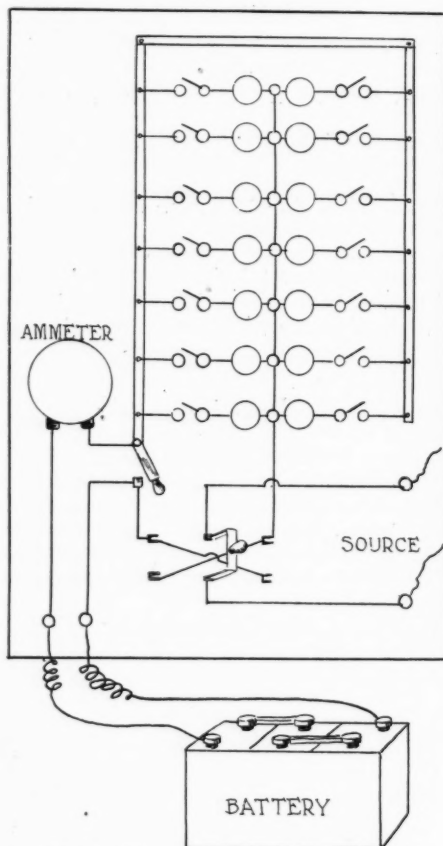


Fig. 4—Charging panel for storage batteries

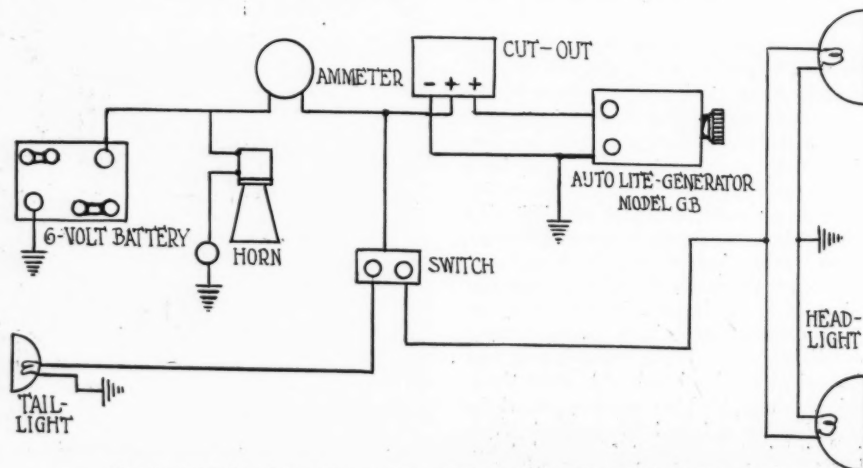


Fig. 5—Simple wiring diagram in which an Auto-Lite generator is used

connected correctly. Simply connect up the battery as shown in the sketch and then throw the double-pole, double-throw switch over to one side and then to the other, noting the ammeter reading in each case, and the side which had the least reading is the correct position for the double-throw switch to be in.

3—The regulator probably is doing the mischief in this case. Set the spring slightly and lessen the clearance of the armature which pulls up at an engine speed corresponding to about 8 m.p.h.

#### Using a Rectifier

Q—Publish a battery-charging outfit made of a bank of lamps whereby I can charge from one to eight batteries, using 110-volt alternating current. If using a rectifier, what type should be used? Can batteries be added at different times? What amperage is generally used for starting and finishing the charge?—F. E. Paulson, Rosedale, Kans.

A battery can not be charged with a bank of lamps using alternating current. A rectifier must be used, and this can be either a motor-generator, a vibrating type of rectifier or an electrolytic rectifier. It is most economical to connect the batteries in series and then run the charging current through the whole series of batteries. A vibrating-type rectifier is the most simple in operation and gives very little trouble. The capacity, however, is not generally sufficient for eight batteries, but will work splendidly on half that number. A motor-generator is probably what you will need for this purpose, as this will furnish the desired capacity. Connect up several lamps in multiple and then break one of the lines running to this bank of lamps and connect in the batteries. By an ammeter determine the direction of the current flow in the line, the one going into the ammeter is the positive and then connect this positive line to the positive of the battery.

#### General Electrical Questions

Q—Show diagram to wire car having Toledo Auto-Lite generator, electric headlights and tail-light and Willard battery.

2—Show diagram of Saxon six-cylinder 1915 model.

3—In wiring a generator to a battery how can the positive be ascertained on the generator?

4—Does the positive pole of the generator connect to the positive pole of the battery?

5—With the Auto-Lite generator would it be necessary to have a regulator?

6—Would it hurt the battery to wire it direct to the generator and run the risk of the battery overcharging?—F. W. Lincoln, Brunswick, Ohio.

1—A wiring diagram of the lighting

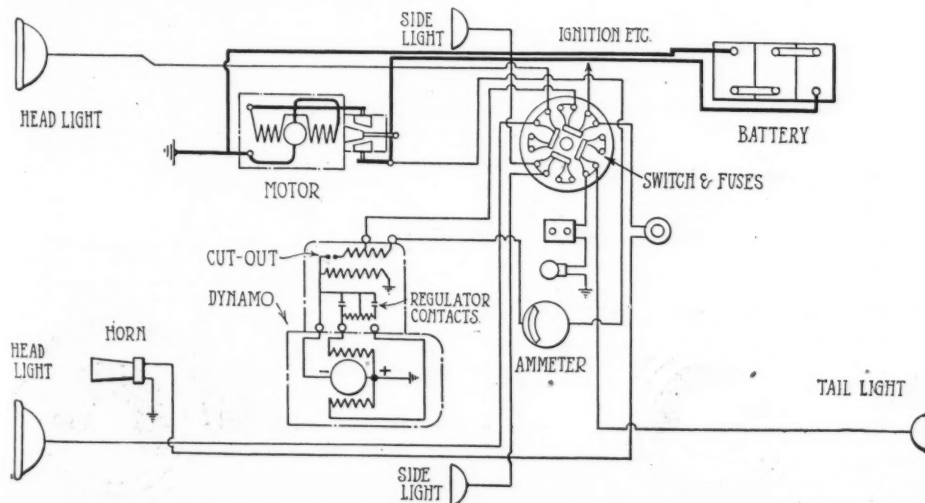


Fig. 6—Wiring diagram of 1915 six-cylinder Saxon

system is shown in Fig. 5. The Auto-Lite generator model GB is built for cyclecars, and its capacity is limited to 60 watts. It is not wise, therefore, to try to use extremely large lamps. In no case should the current rate exceed 6 or 7 amp. This will leave a few amperes for the horn to operate on.

2—The Saxon diagram is shown in Fig. 6.

3—If you have a voltmeter, the positive side of the generator can be very quickly determined, but if this is not the case, dip the two leads of the generator into a glass of water that has a little table salt shaken into it. The wire giving off the most gas is the negative wire.

4—Yes.

5—Yes.

6—There is very little danger of overcharging the battery if it is kept full of distilled water all the time.

## Carburetion

### Vacuum Tank Explained

Q—Explain how a vacuum tank works.—John R. Blake, Rolling Prairie, Ind.

By referring to Fig. 7 the workings of the vacuum tank will be readily understood. Its advantage lies in the fact that the main gasoline tank may be located in any part of the car and usually is carried

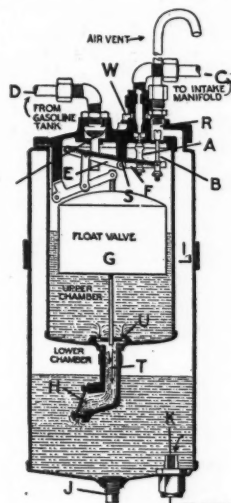


Fig. 7—Cross-section of Stewart vacuum tank, showing operation

at the extreme back end. By this system the gasoline may be raised, and it is not necessary to have the tank above the level of the carburetor to give gravity feed of the fuel. A pipe, C, connects the intake manifold of the engine and the upper chamber of the tank, so that when the piston is on its suction stroke it creates a partial vacuum in the upper chamber of the vacuum tank which must be above the level of the carburetor and usually is attached to the forward side of the dash. This suction also draws gasoline from the main tank at the back of the car, keeping the gravity tank filled at all times. There are two chambers, the upper and lower. When there is no gasoline in either chamber the float and levers, E and F, to which the float is connected, close the valve B, which admits air into the vacuum chamber, and at the same time opens the valve A, connected with the suction pipe C, which is connected with the intake manifold. If the engine is working, a vacuum chamber then is created in the upper chamber, which closes the flapper H by suction, thereby making the upper chamber absolutely air tight, which creates a vacuum and causes the gasoline to be drawn from the main gasoline tank to the vacuum or upper chamber.

As the gasoline enters the upper or vacuum chamber the float rises and through the lever E and F, connected to the float, the valve A to the intake manifold is closed, thereby cutting off further suction and at the same time the valve B is opened, which permits air to enter the vacuum chamber through the air vent tube.

Air entering the vacuum chamber causes the flapper H to open, which action permits the gasoline in the vacuum tank to flow into the lower chamber or gravity tank, thereby causing the float to lower as the gasoline flows out. As the float lowers, the operation of the levers E and F again is brought into action and the valve A again is opened and B closed, which causes H to close and the vacuum and suction takes place again, as noted. The lower chamber is always open to air circulation through the vent tube, otherwise the gasoline would not flow by gravity to the carburetor.

### Installing Vacuum System

Q—I have a 1909 Stevens-Duryea, and the pistons are raised in the center, that is, they are  $\frac{3}{4}$  in. higher in the center than on the sides. Explain the advantage of this. I notice that all aluminum pistons are the same.

2—I am going to put a new Stewart vacuum tank on, and the only place to put the tank is a little in front of the carburetor. I have cut the intake as short as I could to raise the carburetor. So, to avoid flooding the vacuum tank, I have bent the main gasoline pipe, as you will note in the sketch. Is the tank able to draw the gasoline from the main gasoline tank with the pipe bent up like that?

3—Make a drawing showing the way it will work in steep hills without flooding the carburetor.—Albert A. M. Halvorson, Webster, S. D.

1—As might be thought at first, raising the pistons in the center would produce more surface for the pressure to exert itself on, but this is not the case, for the power depends on the projected area of the piston. Raising the piston center is a good way to raise the compression pressure, which is another way of saying that the clearance volume is reduced.

2—The Stewart vacuum system is used where the supply tank is below the level of the carburetor. This is not so in your case. But if you have trouble with the

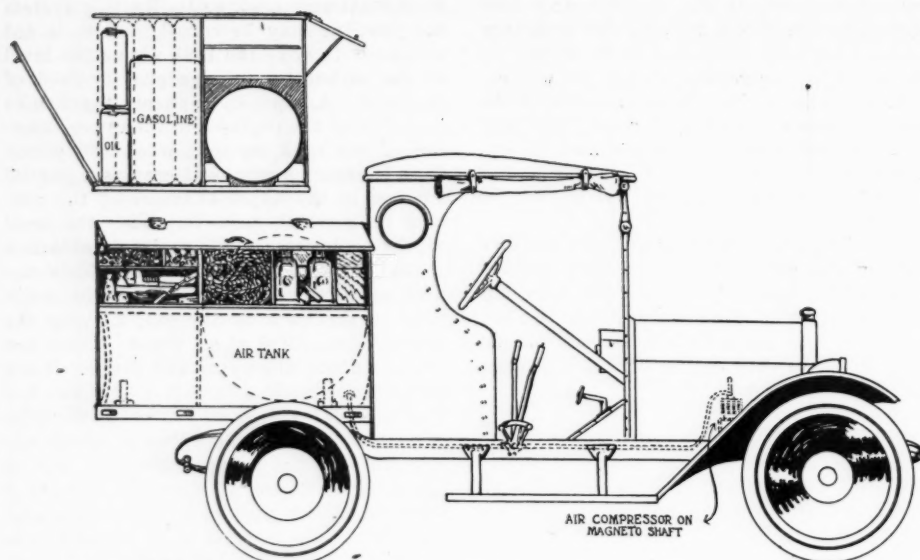


Fig. 8—Suggestion for converting Hudson 20 into service car with compressor and tank mounted on the rear deck

gasoline flowing to the carbureter, it is perfectly possible to use a vacuum system. As long as the pipe leads to the vacuum tank from the supply tank and is not plugged up the gasoline will be drawn to the vacuum tank and no flooding will occur because of the control valve on the vacuum tank.

3—You seem to dread the possibility of flooding. This will not occur if the control valve in the vacuum tank and the one in the carbureter is properly seated. This probably has given you trouble in the past and for that reason you probably expect this to flood, but this is not the case.

#### Adjustment of Stromberg Carbureter

Q—Publish directions for adjusting Stromberg carbureter on Marion-Handley 6-40 model A.—W. J. Baker, Malta Bend, Mo.

See Fig. 9. There are three adjustments. A, the main adjustment, controls the gasoline supply from the float chamber. It carburetes the mixture through the whole driving range and should be set so that the engine shows its best life and power. Turning the nut A to the right raises the needle E and gives more gasoline. Turning A to the left cuts down the gasoline and makes the mixture leaner. If an entirely new adjustment is necessary, turn A until the needle just seats. This point can be noted when C just makes contact with D. Then turn the nut back twenty-four notches. This will give a mixture somewhat rich but after starting and warming up the engine the nut may be turned slightly to give the best running mixture.

The knurled screw B provides an adjustment for idling. Turning the screw to the right gives more gasoline and turning to the left less gasoline. If an entirely new adjustment is required, turn the screw until it seats, then unscrew from half to one and a half turns. Start the engine and complete the adjustment after the engine is thoroughly warm. This adjustment is effective only when the throttle is very nearly closed.

A richer mixture is required when the engine is pulling on wide open throttle than for closed throttle driving. To take care of this without causing the engine to consume an excessive amount of fuel, the carbureter is so constructed that the needle

E remains stationary at the closed and wide open positions, but at positions corresponding to speeds from 10 to 35 m.p.h. the needle drops so that C rests on D, cutting down

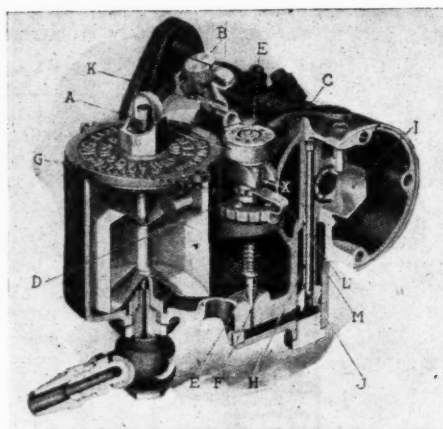


Fig. 9—Stromberg carbureter used on Marion-Handley, with adjustments

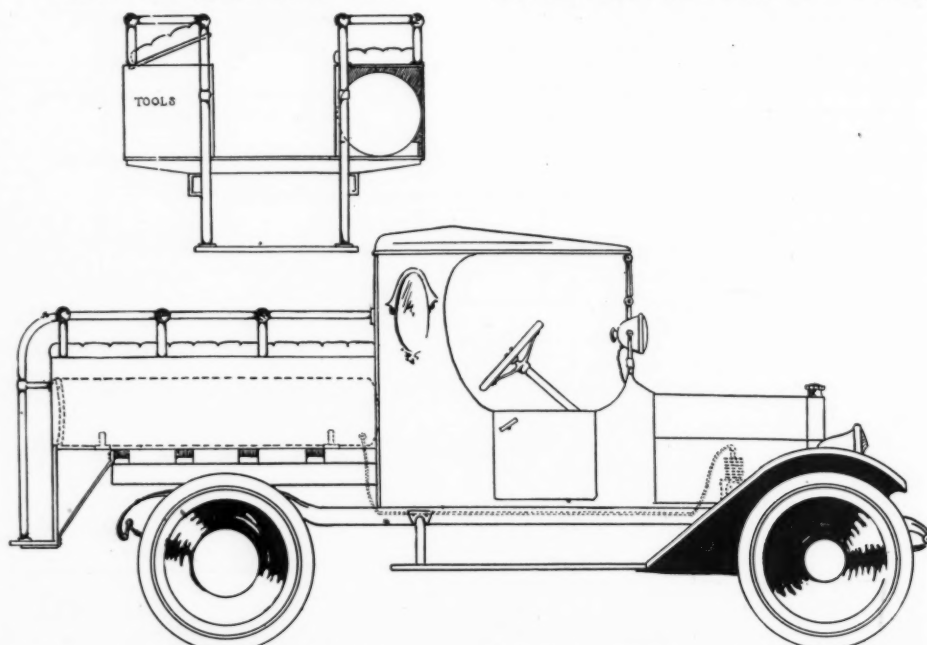


Fig. 10—Suggestion for converting 1911 Hudson 33 into service car

the flow of gasoline correspondingly. The amount of the economizer action, or drop of the needle, is controlled by the position of the pointer L. The notches are numbered and the leanness of the mixture increases with the number of notches. To make this adjustment retard the spark, open the throttle to about the 20-m.p.h. position and set the pointer one notch less than the thinnest mixture on which the engine will run when warm. This will usually be third or four notch.

#### Faulty Carburetion

Q—After installing new blocks, pistons and piston rings, renewing the ignition wiring and Westinghouse head, my 1916 Standard eight touring car on a very hard, or at times on a moderate pull, in high gear will spit back into the carbureter. The jets in the Zenith carbureter have been changed. The warmer the engine, the easier it will spit. The car would have ample power and would take hills on high that I have to drop into second on if it were not for this spitting. A new Stewart vacuum system and new valve springs also have been installed.—J. W. Dillon, Bridgeport, Ohio.

You are experiencing carbureter trouble in one of its many forms. First the gasoline line from the tank to the Stewart vacuum feed must be cleaned to insure that there is impediment in that line. Examine the line to see that no air pockets can be formed from bends which may have occurred. It is very clear that the engine is being run on too lean a mixture of gasoline. This further is indicated by the backfiring when the engine is hot. If the carbureter is not supplying enough gasoline then the remedy is a larger jet. If the carbureter jet is sufficiently large, then condensation in the manifold is taking place, and this can be seen as soon as the engine is stopped, for the gasoline will drip from the manifold. The remedy for this is an efficient heating system for the manifold. There may be an air leak in the manifold connection between the engine and the carbureter, so this must be looked to also.

#### Rebuilding

##### Ford Engine on Sled

Q—Would a Ford engine mounted on a flat bottom snow-sled about 6 ft. wide and 12 ft. long and covered with sheet steel be strong

enough to drive a propeller large enough to be of any good as a snow sled?

2—What power would be required? I have been planning on having the propeller in front and steer from behind.

3—Publish sketch of about how this would look.—R. Mahoney, Bisbee, N. D.

1—A Ford engine will have sufficient power to drive the sled if the pitch of the propeller and the diameter are made to correspond to the power of the engine. A propeller whose diameter is 4 or  $4\frac{1}{2}$  ft. with a pitch of 5 ft. will be the correct size.

2—The propeller located in the front will do more good and will operate more efficiently.

3—This sketch is shown in Fig. 11. We have reduced the size of the sled and made it in the form of four wide skis, the forward two mounted on the Ford axle and spindles for steering. There is also a small sketch along the line of your suggestion with a narrow sharp runner in the rear for steering.

#### To Make Sled

Q—Give suggestion for sled to be used on country roads. We have a Ford engine without the transmission and magneto. Is it necessary to attach an old magneto to the flywheel to add more weight, as we intend to drive sled with a propeller? We expect to put propeller at the front end with slight upward draw. We expect to have a chain drive. Would motorcycle chain and sprockets be sufficiently strong to drive it or would heavier chain and sprockets be required? The idea is to have propeller large enough, and chain and sprockets strong enough to hold all the power the Ford engine could develop, if necessary. Make some suggestions as to runners and steering device that have been tried and found successful. As the road may not always be packed solid, the runners would need to be wide and long enough to carry it over loose snow. What is the best material to make the runners of? Where should the propeller be installed, front or rear? What material should the propeller be made of? The sled is to carry two or three people.—Frank Swanson, Claremont, S. D.

See answer to R. Mahoney, Bisbee, N. D., in this issue. The best thing for both of you, it seems to us, would be to get in touch with each other and compare notes on your methods in building the sleds.

#### Using Car as Truck

Q—Can a model 19 Buick be converted into a truck attachment?

2—Can this be done without purchasing a truck attachment?

3—Can an old two-cylinder Buick chain drive be converted into a truck without much expense?—H. E. McCabe, Corning, Kans.

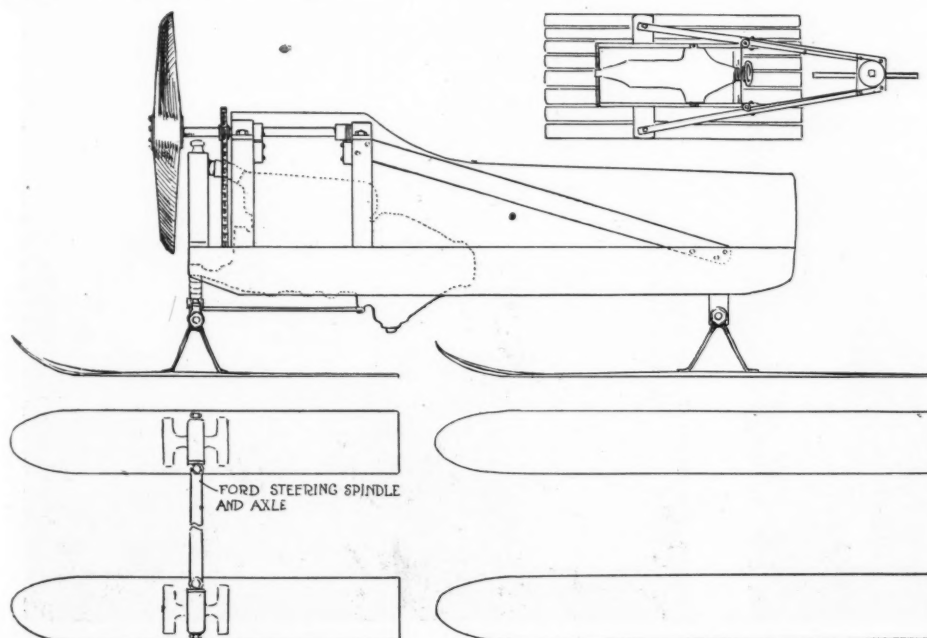


Fig. 11—Layout for snowsled using a Ford engine as propelling power

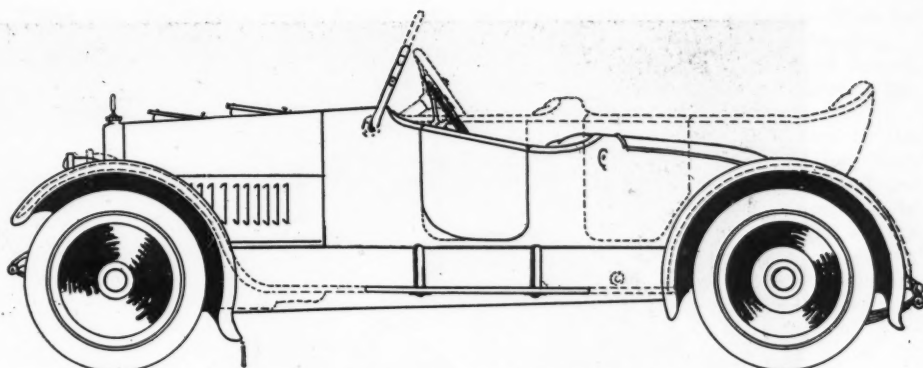


Fig. 12—Suggestion for converting 1916 Hudson Super-six into speedster

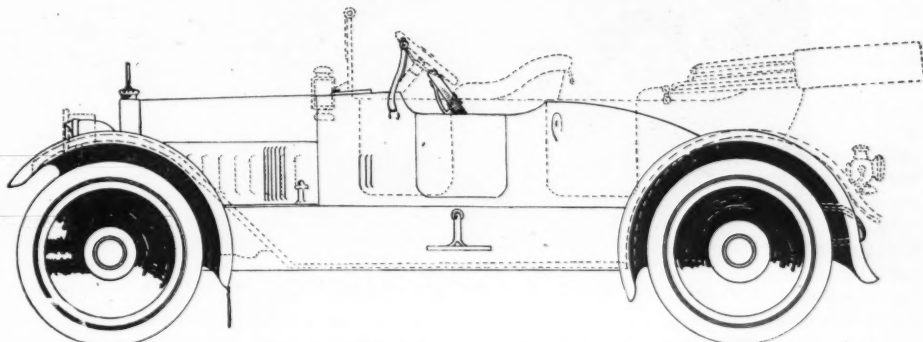


Fig. 13—Suggestion for converting 1913 Case into speedster

1—This may not be necessary, although probably you will desire pulling power rather than speed. By reducing the gear ratio it will give more power and naturally faster engine speed and this may tend to heating if long hauls are made and the engine is run fast. It will be necessary to put in a new pinion and also a new ring gear, for the old ring gear, being worn, will not mesh nicely with a new piston.

2—In using a passenger car for a truck you will have to limit the load, of course, otherwise it will call for only a body to haul whatever kind of material you wish to haul. If you desire to use heavy loads, it will be advisable to use a truck attachment, which is built for just such purposes. Besides, a truck attachment will distribute

the load better, because a passenger car is not designed with the idea of hauling freight.

3—This is covered in the two previous answers.

#### Converting Case to Speedster

Q—Publish suggestion for converting 1913 Case into two-passenger speedster, bucket seats, no fenders, 20-gal. oval tank behind seats and completely inclosed by rear deck. I would like to shorten the wheelbase about 20 in. if advisable.

2—Publish name and address of maker of kerosene carburetor that would fit this car.

3—Suggest suitable color for painting.—Warner M. Wigner, Rosetown, Sask.

1—Case car 1913 model M, converted into speedster, is shown in Fig. 13.

2—Tillotson Mfg. Co., Toledo, Ohio; Stromberg Motor Devices Co., Chicago; Western Carburetor Co., Alma, Mich.

3—Practically any color would be suitable, as it is a matter of taste these days as to color used in car bodies. The tendency is toward bright colors. This might be a sea blue, canary yellow, cream, Brewster green, maroon or practically any other color and not be out of place.

#### Rebuilding Hudson Cars

Q—Publish suggestion for converting a 1910 Hudson 20 into a service car with a compressor and tank mounted on the rear deck?

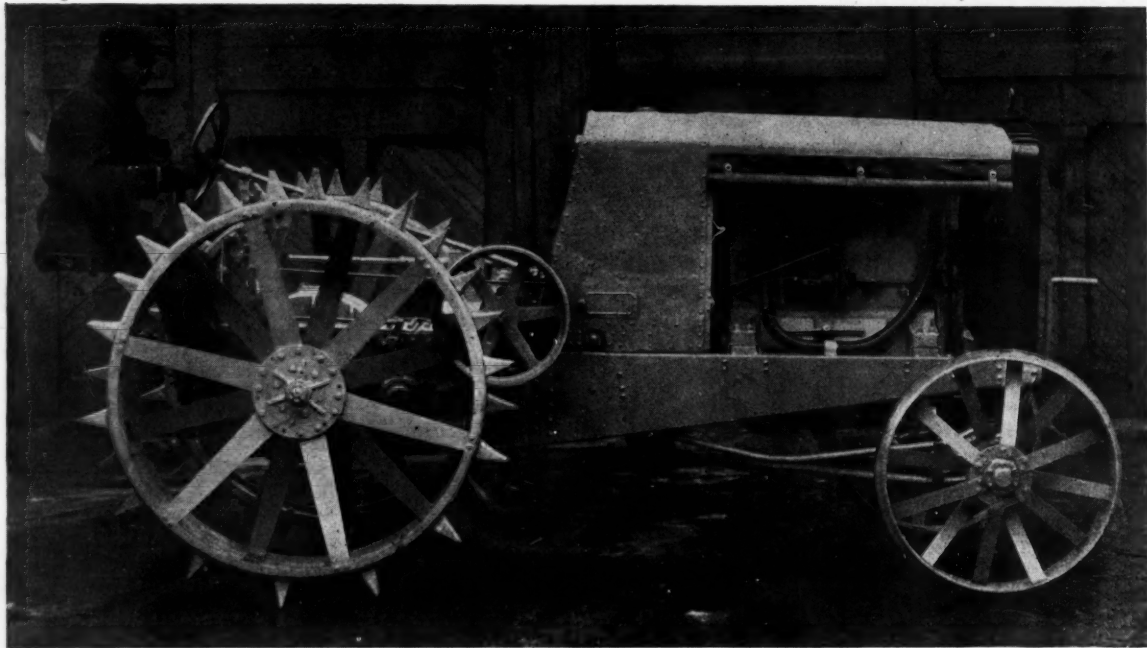
2—Publish suggestion for converting a 1911 Hudson 33 into a service car?

3—Publish suggestion for rebuilding a 1916 Hudson Super-Six into a classy speedster with a turtle deck such as the Schutte body uses? Give us some idea of the cost.—Earl Downs, Chillicothe, Mo.

1—This is shown in Fig. 8.

2—Conversion of Hudson 33 into a service car is shown in Fig. 10.

3—In Fig. 12 is shown a suggestion for converting a Hudson Super-Six into a speedster of the type you refer to. If you construct this body yourself, you probably will save about half the price a body builder would charge, which would be in the neighborhood of \$500.



Accessibility is a feature of the S. W. H. tractor, which is a three-plow machine

## Novel Frame in S. W. H. Tractor

Housing of Gearset and Rear Axle Is Single Casting

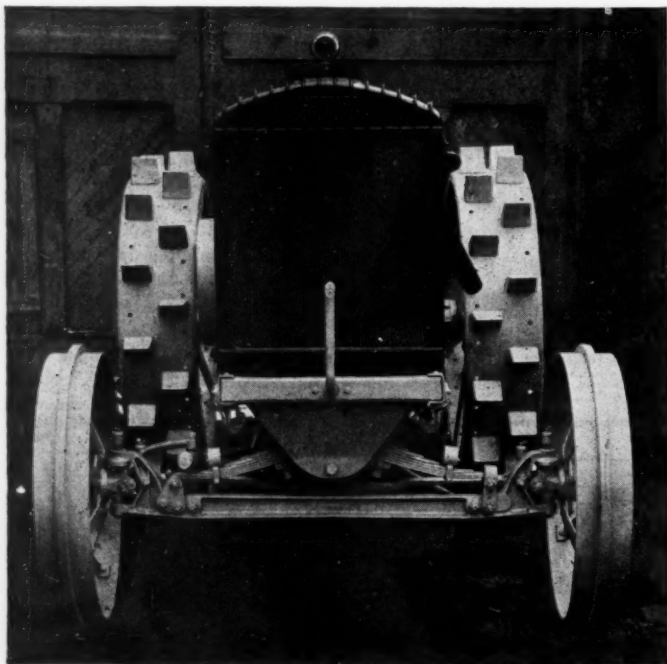
**A** TRACTOR has been brought out by the S. W. H. Engineering Co., Cleveland, Ohio, which embodies many of the ideas experience has approved in tractor design and construction. The new tractor is of the four-wheel type and has three-plow capacity and weighs 4525 lb. without wheel lugs.

The designers have departed from conventional practice to the extent of producing something new and distinctive in the

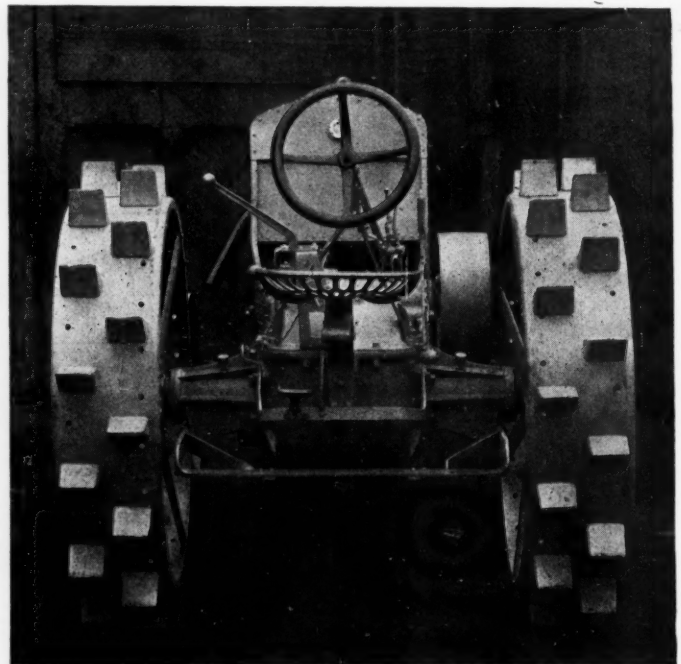
way of frame construction. The housing for the gearset and rear axle is a single casting. The rear axle shafts extend through this housing at the rear and are supported in bearings carried in cast-iron extensions bolted to the housing on both sides. The front end of the gearcase is machined off flat, and to the faced surface thus formed is bolted the rear end of the tractor frame proper. The side members of the frame are of deep section at the

rear and taper toward the front. This makes for a rigid connection where frame and gearcase are bolted together. Near the forward end of the frame is a cross section to which are riveted two brackets, forming a swivel support for the front end of the frame on the front spring.

The front spring is semi-elliptic, 35½ by 2 in., located directly above the front axle and having swivel connection with the tractor frame. The spring is connected to



Note semi-elliptic cross spring supports on front



Rear axle and transmission form a unit

the axle at its right end by a spring bolt and two plates and at its left end by shackle links. Tubular radius rods extend from the front axle just inside the spring connections backward in triangular shape to a 2-in. ball carried in a socket secured to a cross member of the tractor frame. This construction makes for extreme flexibility.

The engine is a special heavy-duty tractor type and burns kerosene. It is a four-cylinder vertical engine with 4¼ by 6-in. bore and stroke. All moving parts are inclosed. Lubrication is by pressure feed to main and connecting rod bearings and splash to all other parts. Ignition is by high-tension magneto with impulse starter. The carbureter is a plain-tube Stromberg type and air is drawn through a cleaner. Fuel feed is gravity. The engine is open flywheel type, permitting ready access to the clutch. The engine has a built-in governor of the flyball type, which maintains a normal speed of 900 r.p.m. At this speed the engine will develop approximately 37 hp.

#### Cooling System

The cooling system consists of a Moline-Spirex radiator with a removable 22 by 23 in. core. The radiator has a large filler spout and Moto-Meter. A 21-in. belt-driven fan runs in a hood at the back of the radiator. Circulation is maintained by a centrifugal pump, and temperature is regulated by a thermostat.

The clutch is a Borg & Beck dry-plate, 12-in. in diameter, carried directly in the flywheel of the engine. It can be removed without disturbing the engine or transmission. To relieve the engine from shocks or from strains due to sudden variations in load a Thermoid three-disk flexible coupling is inserted between the pulley shaft and the primary shaft of the gearset.

The rear axle and gearset form a single unit. The gearset is of the inclosed, spur gear type, and all shafts are mounted either on Hyatt roller or ball bearings. All gears are cut and heat treated and fitted to splined shafts.

There are two speeds forward and one reverse. The low speed gear ration is 54.5 to 1, giving 2½ m.p.h., and the high speed gear ratio is 37 to 1, giving 3½ m.p.h. On the outside of the housing, however, is a pair of gear wheels under a quick removable cover, which can be interchanged with the standard gears to obtain a smaller reduction to the drive wheels. By interchanging these gears it is possible to get a speed range of from 1½ to 9 m.p.h. At the plowing speed of 2½ m.p.h. the maximum drawbar pull is 3500 lb., with a sustained drawbar pull of 3000 lb., while at 3¼ m.p.h. the sustained drawbar pull is 2000 lb.

The power take-off is direct through a pair of bevel gears and is controlled by the same friction clutch as the drive on the rear wheels. The pulley is 18 by 6½ in. with 550 r.p.m., giving a standard belt speed of 2600 f.p.m.

The drawbar is a flatbar secured to opposite ends of the rear axle housing. It is 17 in. high and affords a lateral adjustment of 24 in.

The front wheels are 30 by 6 in. with 1-in. mud band and are carried on Hyatt roller bearings. The rear wheels are 48 by 12 in. and are secured to the axle drive-shafts by taper, key and nut. Spade lugs or angle cleats are furnished as desired. Both front and rear wheels are of the flat-spoke type.

The S. W. H. tractor has a wheelbase of 90 in., a front tread of 56 in. and a back tread of 52½ in. Its width over all is 64½ in.; length, 12 ft. 2 in.; height, 5 ft. 6 in.; minimum ground clearance, 13 in.

#### SHOW OF NORTHWEST

(Concluded from page 31)

been seen many times before. The models this year, however, show many refinements and changes, many of them important.

The Allwork, shown by the Electric Wheel Co., Quincy, Ill., has a new round fuel tank instead of the square tank used in former models, much improving the appearance of the machine. The radius rods have been strengthened also by surround-

ing them with gas pipe sections. Thus reinforced, there is no danger of bending.

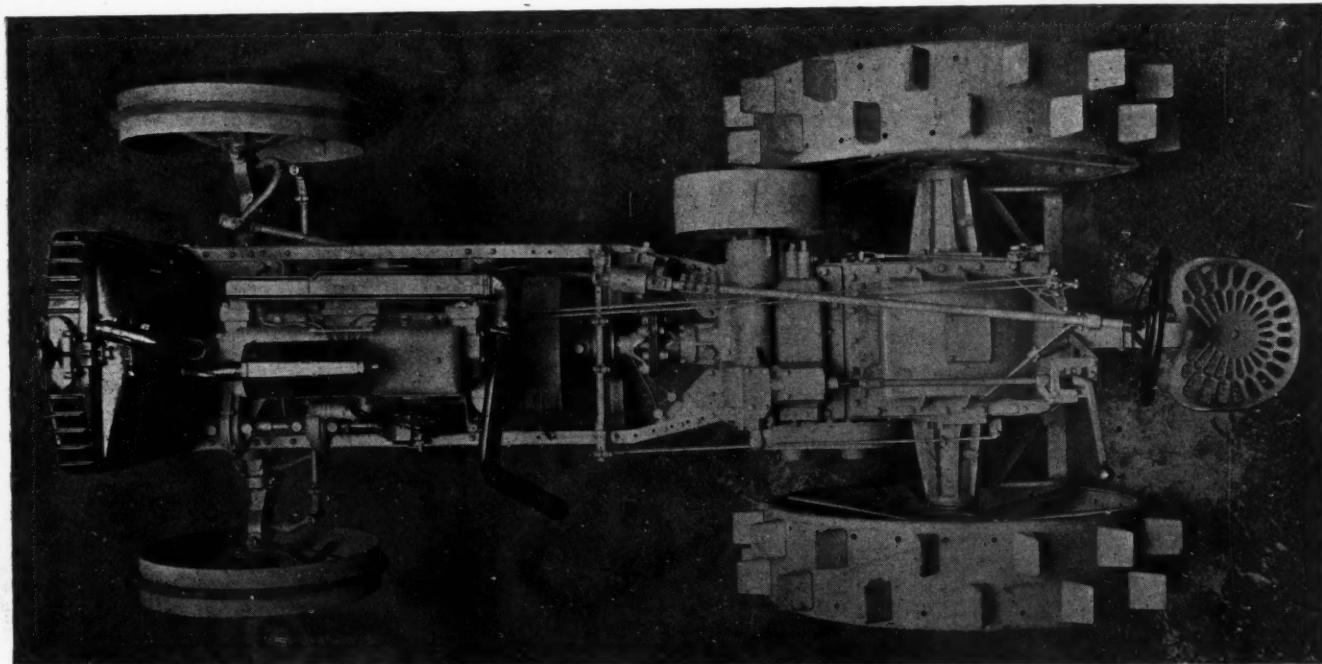
The Rock Island Plow Co., Rock Island, Ill., has added a Bennett air cleaner to the Heider as regular equipment.

The 12-24 Biltwell, manufactured by the Velie Tractor Co., Moline, Ill., has been given a three-speed transmission, and the size of the engine has been increased to 4¼ by 5½. A patented feature on the Velie is a water circulating pump driven at the end of the camshaft at camshaft speed and a submerged oil pump in the lower part of the crankcase, which provides a forced feed lubrication at 40 lb. pressure. Another novel feature is the injection of steam into the manifold just above the carbureter. A Bennett air cleaner also is regular equipment on the new model. The company has planned to turn out 1000 tractors during 1919, and the price to the farmer will be \$1,865.

The Stinson Tractor Co., which recently moved from Minneapolis to Superior, Wis., expects to be in production to the extent of one tractor a day soon. The price on the 1919 model will be \$2,200. A novel feature on the Stinson is the telescoping pipe frame which converges from the frame of the tractor proper to the steering wheel in front. The normal position of the steering wheel is midway of the width of the tractor, but by telescoping either side of the frame extension the front wheel can be moved to either side until it is in alignment with the right or the left drive wheel of the tractor to accommodate itself to plowing or hauling conditions.

With few exceptions, all the tractors shown at Minneapolis will be at Kansas City next week.

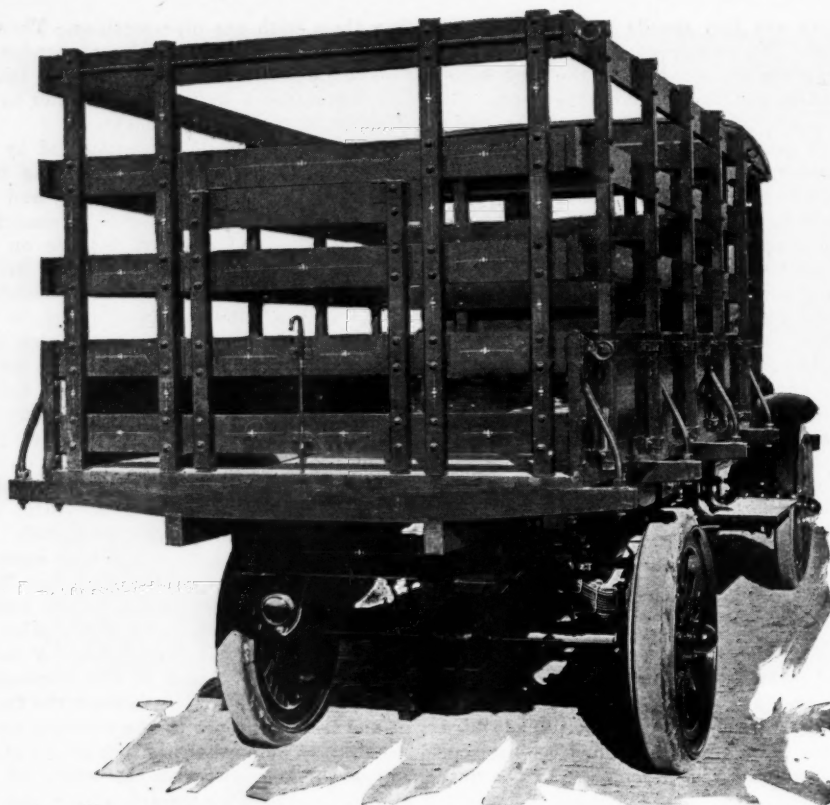
There is practically nothing new in either the motor truck or motor car sections of the Minneapolis show. One or two trucks, made in the vicinity of Minneapolis, are here which did not appear at Chicago or New York, but there is nothing among the motor cars which has not been seen elsewhere or which has not been mentioned in the reports of the earlier shows.



This airplane view of the S. W. H. tractor shows the novel frame construction

## Truck for Farm Work

Douglas Fitted with Combination Cattle Rack and Grain Body



The end gate shown herewith is a feature of the combination Douglas body



Side view of Douglas 1 1/2-ton truck for farm work

THE truck made by the Douglas Motors Corp., Omaha, Neb., is offered in one capacity only, 1 1/2 tons. A special combination body is fitted to the chassis. This consists of a cattle rack with an end door for hogs and a grain body with a trap door for dumping grain. This trap door is a special feature, as it enables 60 per cent of the load to be dumped without using a scoop.

The chassis has a wheelbase of 127 in. and is an assembled unit, with a Buda engine, Schebler carbureter, Pierce governor, Eisemann magneto, Borg & Beck dry-disk clutch, Grant-Lees transmission and Torbenson internal gear drive. The tire equipment is 34 by 3 1/2 for the front and 34 by 5 for the rear.

The engine has a bore of 4 1/8 in. and a stroke of 5 1/2 in., is cooled by centrifugal pump, and the lubrication is with a piston pump which delivers the oil to pockets above the main bearings and flows by gravity to the bearings.

The chassis, with the combination body, sells for \$2,250, and the equipment includes electric lights, Auto-Light generator with Willard battery, Stewart vacuum system and bumper.

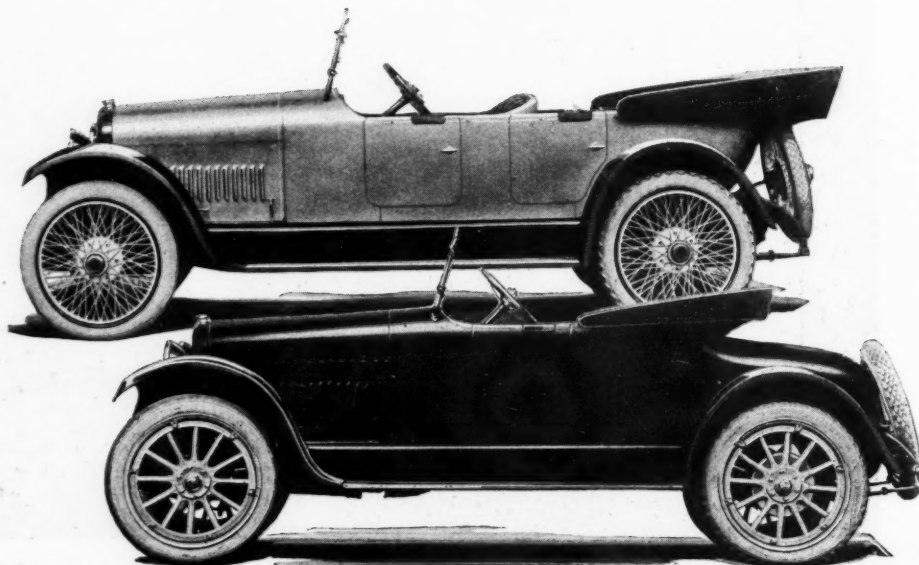
The Douglas company is occupying a newly built factory, which has floor space of 40,000 sq. ft. The estimated production for 1919 is 400 trucks. The company is employing at present seventy-five persons. Its investment in tools runs around \$45,000, in addition to its owning the building which it occupies and a large stock of supplies.

George Christopher, a cattleman and land owner near Valentine, Neb., heads the concern. Mr. Christopher is a typical ranchman and says that he is only a cow-puncher making trucks. He says the ranch-owner's transportation problems can be solved with the aid of the truck.

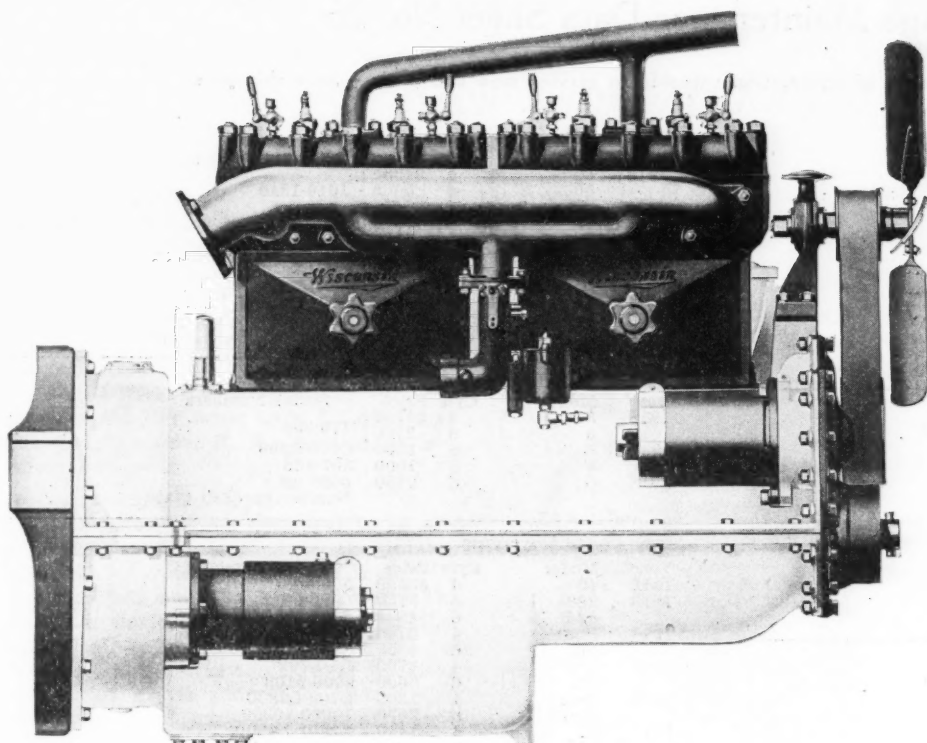
## New Nash Models

The work of designing and building a new four-passenger and a two-passenger roadster has been completed by the Nash Motors Co., Kenosha, Wis., and the two will be ready for delivery about May. The four-passenger is an entirely new body design and presents a smart, racy appearance. It is a four-door model with long, sweeping lines low on a wheelbase of 121 in. The trimmings include outside door handles and are nickel. Two windows in the rear are fitted with beveled glass.

Special equipment on the four-passenger includes Warner lens, white wire wheels and cord tires. The two-passenger is a roomy roadster in which the essentials of comfort, power and economy are observed.



# Six Engines in Wisconsin New Liberty Line



One of the Liberty models of Wisconsin engine line

**T**HE new line of four-cylinder engines now in production by the Wisconsin Motor Mfg. Co. is known as the Liberty models. The line includes type RAU, with  $4\frac{3}{4}$  by 5 bore and stroke; RBU, 5 by 6; TAU, 4 by 6; UAU,  $4\frac{1}{4}$  by 6; CAU,  $3\frac{3}{4}$  by 5, and EAU, 4 by 5, the last two being for smaller powers and differing principally from the others in that the cylinders are cast in block with solid head instead of detachable.

The larger models, RAU and RBU are of the L-head type, twin-cylinder, with detachable heads, and are designed to handle the lower grades of fuel now on the market. The crankshafts are of chrome nickel steel. The crankcase is of aluminum with massive webs supporting the bearing housings. A large combined breather and oil filler is fitted to the forward end of the engines on the same side as the oil gage. The flywheel is inclosed in the bell housing cast integral with the crankcase.

One of the most important features of these engines is the three-point suspension. A cast-steel or malleable supporting arm is bolted to the bell housing, while a large-diameter trunnion bearing on the iron front cover forms the forward support. This entirely eliminates the aluminum supports, which is said to prevent trouble from breakage of the aluminum arms due to vibration and make replacement cheaper in the remote event of breakage of a steel arm due to accident.

The camshafts have large-diameter bearings so the cams will pass through, and a flange is forged integral for the mounting of the camshaft gear. These shafts are held in position by spring plungers at the forward end, which also take up end thrust. The valve tappets are of the roller follower type, of extra large diameter.

The tappets, rollers and roller pins are hardened, giving long life to these vital parts. The guides are of cast iron held in place by crabs and studs. This entire mechanism is inclosed by oil-tight cover plates which keep out the dust. Openings are provided into the crankcase so the oil vapors rise to lubricate the tappets and valve stems. The timing gears are wide face, helically cut, the smaller being drop forgings, heat treated, and the camshaft gear cast iron.

All main and connecting rod bearings, as well as camshaft, pump driveshaft and idler gear bearings, are of babbitt-lined bronze. The main and rod bearings are fitted with one-piece laminated shims.

Oiling is by pressure with an oil header cast into the crankcase with leads to the main bearings. The crankshafts are drilled so oil also is forced to the connecting rod bearings and through tubes on the rods to the wristpins. The oil pump is bolted to the upper crankcase and extends down into the oil reservoir. A large screen surrounds the oil pump. This can be removed for cleaning without disturbing the oil pump or the oil pan. A relief valve is provided on the pump of all except the two smallest models, which do not need it owing to the pump being smaller and not requiring pressure relief. By this valve a constant pressure is maintained.

The inlet and exhaust manifolds are cast of iron in one piece and so designed that the heat of the exhaust will vaporize the low grade of fuel now in use. A substantial fan drive is provided with a 2-in. belt to drive the larger fans necessary for truck or tractor service. Provision is made for mounting electric generators and starting motors by the S. A. E. standard flanges. These units, as well as the carburetor and

## Models Embody Latest Developments in Design

magneto, are so distributed as to leave all mechanism very accessible. Mounting of the steering gear on either the right or left of the engine is provided for in the location of the various accessories.

Models TAU and UAU differ in that the cylinders are cast in block instead of twin castings, and the tappets both on these and the two smaller models are of the mushroom instead of roller type.

### ILLINOIS WORKS ON ROAD PLANS

Chicago, Feb. 14—One of the best commercial aids to the country's period of reconstruction is a good system of good highways. That the state of Illinois is not slow to appreciate this fact can be seen from the intense activity which is being taken in the construction of good roads. Illinois is so enthusiastic over the proposition that the \$60,000,000 road bond issue carried by a popular majority of over 500,000. The vote was not confined to one territory in particular, but was carried by a majority in every county.

The roads in Cook county which lead into Chicago are considered so important that \$18,000,000 of the total will be spent on the roadways of Cook county. This is to be spent in 1919, labor conditions and other controlling influences permitting, and as soon as weather permits the problem will be attacked with more vigor than ever.

An encouraging sign for good highways is the interest motor car companies are taking in the construction of roadways. It is believed that much help will be received from both passenger and truck manufacturers.

Engineering parties making reconnaissance surveys are now at work in different parts of the state collecting information as to available routes, the comparative cost of improving different routes, the topography and the service the different routes will render. With this information the department of public works and buildings will make a definite decision as to the roads to be improved. There are 4800 miles of roadway to be located. Naturally it involves much labor and time as to the mapping out of a plan that will render the most expeditious service.

### TRUCK SERVICE MEETINGS

St. Louis, Mo., Feb. 14—The Packard-Missouri Motor Co. has started an entirely new service work, as far as this community is concerned. One evening last week the drivers and shipping clerks who handle and work with Packard trucks were invited to a "blowout" at the Pelko Garage clubrooms. Besides the good time program, there was much discussion of the proper use of Packards. Also the recent efficiency test for Packards was explained. A surprising number of men asked for information concerning the truck they used. Similar meetings will be held once a month.

# Serial Numbers of Passenger Cars

## Motor Age Maintenance Data Sheet No. 26

One of a series of weekly pages of information valuable to service man and dealer—Save this page

### PILOT

Year	Model	Cyls	Price	Serial Numbers
1912	40	4	\$1800	400-550
1913	40	4	2000	1400-1550
	50	4	2250	
	60	6	2500	
1914	50	4	2500	1551-1621
	60	6	2785	
1915	55	6	1885	1700-1755
1916	6-45	6	1100	1756-2070
	6-55	6	1685	
	8-55	8	1785	
1917	6-45	6	1150	2071-2999
1918	6-45	6	1295	3000 up Number on left frame horn

### PREMIER

Year	Model	Cyls	Price	Serial Numbers
1912	40	4	\$3000	4000-4900
	60	6	3750	
	60-N	6	3750	5000-5500
1913	40	6	2735	7000-9000
	60	6	4000	
1914	48	6	2735	10001-10200
	49	6	2385	10500-10999
	A	6	2775	12000-12800
1915	50	6	1985	6515165-6515500
	51	6	2300	
1916	6-B	6	2285	0001-3550
1917	6-B	6	2285	3500 up

### REGAL

Year	Model	Cyls	Price	Serial Numbers
1912	N	4	\$900	2201-5100
	L	4	1000	2101-3000
	H	4	1400	301-450
1913	T	4	950	5101-7700
	C	4	1250	1-450
	H	4	1400	451-600
1914	T	4	1125	7701-9000
	C	4	1350	453-600
1915	D	4	1085	10171-11254
1916	D	4	650	3074-3525
	E	4	985	11255-11550
	F-8	8	1200	244-550
1917	J	4	695	24382 up Number on left hand frame member at spring

### REO

Year	Model	Cyls	Price	Serial Numbers
1912	R-5, ST-5	4	\$1055	36001-42000
1913	R-5, ST	4	1095	42001-52000
1914	R-5, S-5, D	4	1175	52001-64000
1915	R-5, S-5, L	4	1050	64001-76000
	M	6	1385	101-2100
1916	R-5, S-5	4	875	76001-96000
	M, N	6	1250	2101-10200
1917	R-5, S-5	4	875	96001 up
	M, N	6	1150	10201 up
1918	M	6	1385	20100 up

### ROSS

Year	Model	Cyls	Price	Serial Numbers
1916	A	8	\$1350	1003-1495
1917	C	8	1550	1496-1721

### SAXON

Year	Model	Cyls	Price	Serial Numbers
1915	A, A-1, A-2, A-3, B, B-1, B-2, 14	4	\$395	1000-9740, 101-321, 101-519, 101-300, 10102-15002, 351-1300
1916	B-5-R	4	395	342-736
	S-2-R	6	785	101-9601
1917	SR	6	865	101-19201
	B-7-R	4	495	102-30703
				As strictly yearly models have not been built, and as in a few cases the serial numbers conflict it is not possible to give full details
				Number either on instrument board or on front seat heel board
1918	Y-18-T	6	....	1200 up

### SCRIPPS-BOOTH

Year	Model	Cyls	Price	Serial Numbers
1915	C	4	\$775	3146-7262
1916	C	4	825	
	D	8	1175	102-802
1917	C	4	825	7263-8146
	D	8	1285	803-1496
	G	4	935	3-855
1918	D	8	1285	1497
	H	8	1285	2
	G	4	1065	856
	39-40-41-42	6	{1385 1988}	9000

### SENECA

Year	Model	Cyls	Price	Serial Numbers
1917	A	4	\$735-850	500-1000
1918	D	4	850-925	1000 up

### SIMPLEX

Year	Model	Cyls	Price	Serial Numbers
1913	30	4	\$4850	1040-1310
	50	4	5600	
	90	4	6450	
1914	A	4	5600	1311-1498
	D	4	6100	
1915	..	..	..	1499-2079
1916	38	4	4100	2080-2253
	50	4	4600	
	46	6	5000	
1917	5	6	6000	2254-2357 Number on dash plate

### STANDARD

Year	Model	Cyls	Price	Serial Numbers
1916	8	8	\$1735	175-356
	6	6	2100	C100-C599
1917	E	8	1850	
	F	8	1900	357-466
1918	G	8	2450	6600 up Number on dash plate

### STEARNS-KNIGHT

Year	Model	Cyls	Price	Serial Numbers
1912	40	4	\$3500	5000-5875
1913	28-9	4	3750	6000-6412
	42-8	6	4850	8000-8327
1914	Four	4	3750	6500-6800
	Six	6	4850	8328-8728
1915	L-4	4	1750	L1-L702
	Six	6	5000	9000-9109
1916	Four	4	1395	L703-L2800
	Eight	8	2050	10000-10900
1917	32	4	1450	L2801-L4800
	33	8	2150	10901-12000
1918	4	4	1785	4745-5900
	8	8	2575	12079-12350 Numbers are on dash name plate

### STEPHENS

Year	Model	Cyls	Price	Serial Numbers
1916	65	6	\$1125	101-1100
1917	65	6	1250	
	75	6	1385	10001-13000
1918	76	6	1850	

### STUTZ

Year	Model	Cyls	Price	Serial Numbers
1912	A	4	\$2000	Series A
1913	4-B	4	2050	Series B
	6-B	6	2300	Series E
1914	4-E	4	2150	
	6-E	6	2400	Series F
1915	HCS	4	1475	
	4-F	4	2275	Series C
	6-F	6	2525	
1916	4-C	4	2300	Series R
1917	4-R	4	2550	Series S
1918	4-S	4	2750	(Also 300 Speedsters Series S, built in 1917. Year is indicated by Series letter)

### STUDEBAKER

Year	Model	Cyls	Price	Serial Numbers
1913	SA	4	\$885	600001-603002
	AA	4	1290	
	E	6	1550	
1914	Four	4	1050	403001-420515
	Six	6	1575	605001-612450
1915	Four	4	985	423001-504483
	Six	6	1385	500001-617155
1916	4-40	4	885	460001-474180
	6-50	6	1050	630001-637260
1917	4-40	4	940	474181-500369
	6-50	6	1180	100000-109500
	..	4	895	637261-655270
1918	..	6	1295	200000-207500
	..	6	1695	109501 up
	..	6	1695	207501 up
				1913 numbers on front seat heel board, 1914-15 on front door pocket, first series 1916 on front toe board, later models inside dash

### SUN

Year	Model	Cyls	Price	Serial Numbers
1916	17	6	\$1095	161-16145
1917	17	6	1095	16146-17413 Number on right side of frame at front

### TEMLAR

Year	Model	Cyls	Price	Serial Numbers
1918	A-445	4	\$2185	1 up

# The Accessory Corner

## New Fitments for the Car

### Lane's H-C Jack

ALTHOUGH there has been no change in the general design of the Lane jack, the operation of removing the long handle has been simplified by a modification which provides a small trigger just below the handle. The simple pressing of this trigger upward releases the handle and permits its removal. With the exception of this refinement the line made by the Lane Bros. Co., Poughkeepsie, N. Y., remains as before.

### No-Nox Carbon Destroyer

The No-Nox carbon destroyer is an air moistener to be attached to the intake manifold. A hole is drilled and tapped in the manifold and the suction draws air from the device in such a way that the outside air entering the device has to go through the water in the form of bubbles. The moist air is claimed to reduce the accumulation of carbon in the cylinders and so do away with attendant evils. The price is \$7.50 for Fords and \$10 for all other cars. It is made by the Carbon Destroyer Appliance Co., 1777 Broadway, New York.

### Sliding Gearset for Fords

A four-speed, sliding gear gearset for Fords is made by the Laurel Motors Corp., Anderson, Ind. The device is complete with driveshaft and replaces the entire unit between the universal joint and the rear axle. The gears are at the rear end of the driveshaft close to the axle and gear control is by a lever which connects with the gearset by a rod. The device requires no machine work for installation and may be placed on Ford passenger cars and on worm, internal gear and chain-drive attachments. The Ford transmission remains in place on the engine. The price is \$85.

### Scott Telecator and Lock

The Scott telecator and lock is made in two types, one for installation on the dash and the other for garage or repairshop use. The equipment is designed to enable the user to ascertain the condition of the ignition system with a minimum of trouble, and in addition the dash type provides an automatic lock which operates every time the car is stopped. The device consists of a neat case with push buttons for testing

the spark plugs and corresponding windows which indicate existing conditions in the ignition system. A push-in switch stops and locks the car and a pull-out switch is used to test the ignition. If left out it acts as a spark intensifier. A trouble-finding booklet furnished with the equipment and used in conjunction with it assists in the detection of faults in connection with

insulation, battery, terminals, etc. Models are made for passenger cars, trucks, tractors, airplanes and motor boats by the Scott Corp., 33 West Forty-second street, New York.

### Flashon Anti-Skid Chains

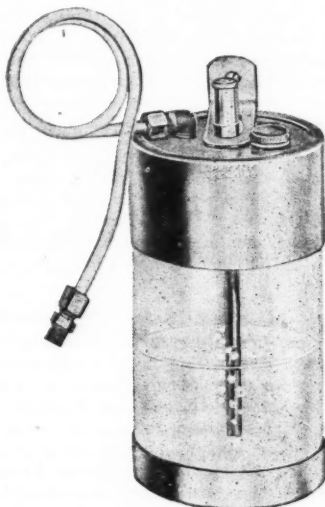
The Flashon chains consist of a single unit of chain at one end of which is a patented interlocking link. At the other end the chain is divided into two short lengths, V-fashion. These short lengths are drawn around the wheel spoke and are held together by the link. The latter consists of a pair of hooks and a link designed to insure a rapid and positive lock. These chains are made in nine sizes, sufficient to fit all makes of trucks and all sizes of solid tires on either wood or steel wheels. For single tires prices run from \$1.70 to \$3.25 a unit. For dual tires the price is from \$2.55 a unit up. They are made by the National Chain Co., 30 East Forty-second street, New York.

### American Traction Rings

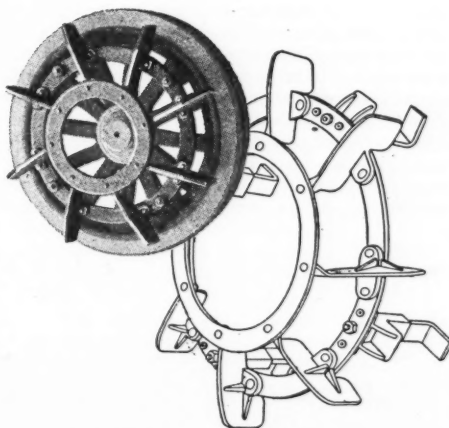
The American rings are intended to be applied to the living wheels of a truck or passenger car to provide positive traction to deep mud, snow, sand or heavy soil. The blades are so set out from the tires that chains can be used if desired. The entire device can be removed from the wheel simply by taking out the securing bolts. Another feature is that the outsides of the blades are so shaped that they will slip off curbs or other solid obstructions. The blades are set at an angle of 15 deg. so they may exert efficient pressure as they come into action below the horizontal hub line. They do not come into contact with hard road surfaces. The American Traction Ring Co., White Plains, N. Y., makes them.

### Derf Spark Plug

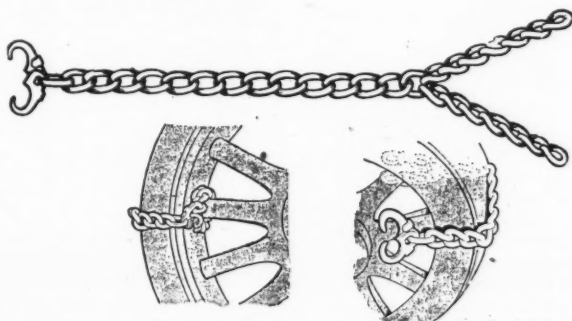
The Derf spark plug has a circular electrode so placed that a spark may be had at any place around the circumference. It is made in all sizes and threads. The price is \$1.50 and the maker, the Derf Mfg. Co., Inc., 90 West Broadway, New York.



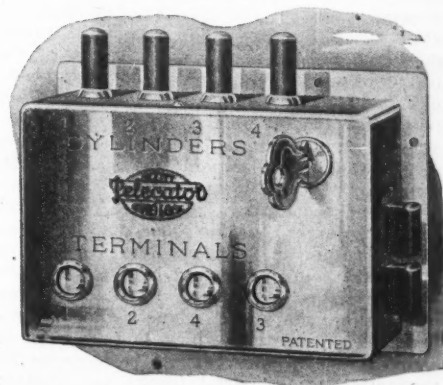
No-Nox carbon destroyer



American traction rings for cars and trucks



Flashon anti-skid chains



Scott telecator and lock

# Among the Makers and Dealers

## Short Trade Notes

**VOGELER Is King G. M.**—W. R. Vogeler, for the last six years export manager of the King Motor Car Co., New York, has been appointed general manager to take the place of E. A. Scheu, who has been made general sales manager.

**Commerce Motor Car Official Dead.**—George J. Kellogg, for eight years secretary and treasurer of the Commerce Motor Car Co., died recently following an operation. He was an official of the Commerce company from the day of its incorporation.

**French Back with National.**—Lucius S. French, after a year in the motor equipment section of the Ordnance Department, has returned to the National Motor Car & Vehicle Corp., Indianapolis, Ind., as advertising manager. A. E. Vinton, who has been acting advertising manager, has been made director of export sales.

**Distributor Closes Wisconsin Territory.**—L. H. Boydston, regional representative for the Service Motor Truck Co., Wabash, Ind., with headquarters at Chicago, has closed a distributor's contract with the Upham-Schacht Co., Inc., Milwaukee, Wis., for Wisconsin. The company occupies a large building and will convert it into an exclusive truck service station.

**Standard Parts Back to Peace Plan.**—The Standard Parts Co. is again on a peace basis and operating under the plan of separate management for each of its various plants. During the war the company centralized all activities in the general offices at Cleveland to conserve man power, and particularly because the greatest part of all production was for the Government.

**New Wilson Body Plant.**—Construction of an addition to the C. R. Wilson Body Co., plant, which will give the company daily capacity of 800 bodies at its plants in Detroit and Bay City, is to be completed within sixty days, the entire construction covering a period of five months. The construction is of steel and concrete with great window space and was carried on with less speed than usual because of the necessity of laying concrete beds, some of them 13 ft. deep, for the foundations of huge sheet metal presses. The addition is 360 by 80 ft., three stories high and has 86,400 sq. ft. of floor space.

**B. R. & L. Co. Changes Officers.**—The Baker R. & L. Co., makers of Rauch & Lang electric, Owen magnetic gasoline cars and B. R. & L. industrial trucks and tractors, has made several changes among its administrative staff. C. L. F. Wieber has resigned as president and is now acting as chairman of the board. Fred R. White, previously vice-president and in charge of production, is now president. N. J. Bartlett, previously manager of the commercial department, is now vice-president and general manager. R. M. Owen and D. C. Durland remain vice-presidents of the company. Robert C. Norton remains treasurer, but for some time has been in France as a major of artillery. His active duties are being performed by W. P. Southward, assistant treasurer. F. W. Treadway remains secretary and counsel of the company. The company which is now running about ten cars daily expects to increase its production of industrial trucks and custom bodies and continue to produce on its present scale its other products. Manufacture

of 4000 cars is contemplated in 1919. The largest production increase will be in the production body department and in industrial trucks.

**Cooke Is Racine Rubber G. S. M.**—R. Y. Cooke has been made secretary and general sales manager of the Racine Rubber Co., Racine, Wis., and director of the Ajax Rubber Co., New York.

**Wood to Represent Commerce.**—W. B. Wood, for seventeen years Detroit manager for Fairbanks, Morse & Co., one of the best known Detroiters in the automotive business, has joined the sales force of the Commerce Motor Car Co. and will represent that company in western territory.

**Two New Salesmen for Buda.**—The Buda Co. has added to its sales force Capt. C. E. Frudden, who before joining the Motor Transport Corps was for several years chief engineer of the Parrett Tractor Co., and C. D. Vincent, for many years connected with the United States Steel Corp. in a sales capacity.

**Hoagg Is Hyatt Sales Engineer.**—K. K. Hoagg has been appointed sales engineer of the Hyatt Roller Bearing Co., Detroit. Mr. Hoagg, who has been connected with the company since 1912, left his position as assistant chief engineer to go into Government service. For eleven months he was in the engineering division of the Motor Equipment Section of the Ordnance Department, stationed in Washington and Indianapolis.

**More Room for Ahlberg Bearings.**—Owing to the ban on building operations during the war, the Ahlberg Bearing Co. has had to wait until this time to commence work on its new plant in Chicago. It is expected the new factory will be ready for occupancy the latter part of February. It will be two stories, of steel and reinforced concrete, with a floor space of about 20,000 sq. ft. The lighting has been so designed that every part of the building will be available for the handling of the remaking process. Provisions have

been made for a hardening plant also. The first floor will contain the salesroom, stockroom and shop. The executive and general offices will occupy the second floor, and a garage will be erected in the rear.

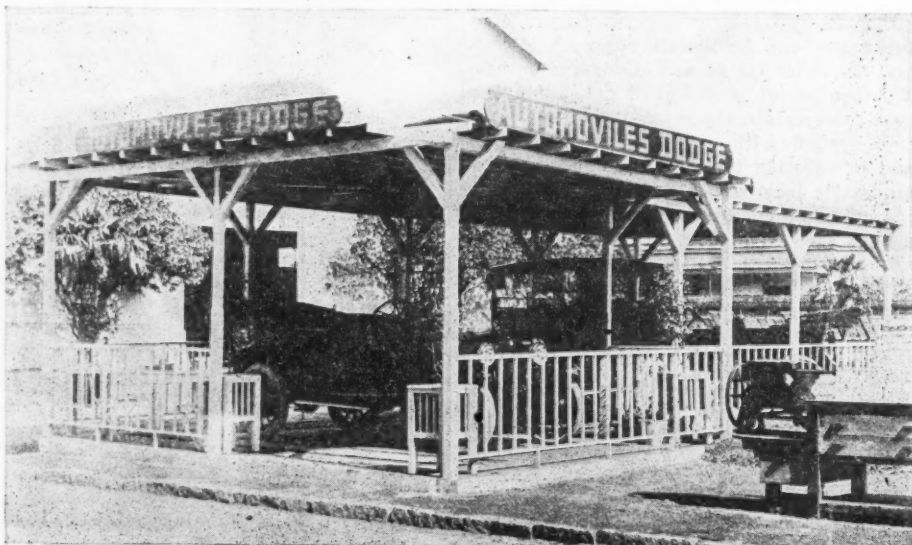
**Case Becomes Garfield A. M.**—J. M. Case, former sales and advertising manager of the United Motors Co., Grand Rapids, Mich., has become advertising manager of the Garfield Motor Truck Co., Lima, Ohio.

**Stewart Warner Declares Dividends.**—Stewart Warner Speedometer Corp., Chicago, has declared a 2 per cent quarterly dividend on common stock, payable Feb. 15 to stockholders of record Jan. 29. Previous rate has been 1½ per cent quarterly.

**Brunswick Tire to Add.**—The Brunswick-Balke-Collender Co., Muskegon, Mich., is to have a \$200,000 addition to its present factory to be used for the production of rubber goods made from the left-over materials of tire making. About 500 men will be employed.

**H. T. Melhuish Heads Fulton Branch.**—H. T. Melhuish, for some years advertising manager of the Fulton Motor Truck Co., Farmingdale, L. I., is going to Philadelphia to take charge of the Fulton office in that city, succeeding M. R. Sanborne, who goes to the Kansas City office. Mr. Melhuish is a brother of William Fulton Melhuish, president and founder of the Fulton Motor Truck Co.

**New Control for Reliance Truck.**—Important changes in the control of the Reliance Motor Truck Co., Appleton, Wis., were made at the annual meeting of stockholders. Ira L. Miller, president and general manager, retired and is succeeded by John M. Balliet, who has been vice-president. M. Weyenberg was elected vice-president. The company was organized about a year ago out of the former Racine Motor Truck Co., Racine, Wis., which moved to Appleton. A new plant costing nearly \$100,000 was built and equipped for manufacturing motor trucks and a new type of internal spur gear drive rear axle for trucks developed by Piggins Brothers, Racine. This has been perfected and will be



AN AMERICAN CAR IN BRAZIL—This Dodge Brothers roadster is "at home" in front of the municipal theater in Sao Paulo, Brazil

produced in quantities together with the Reliance truck, which has now been placed in production.

**Kelly Is Cole G. M.**—J. H. Kelly, formerly production manager of the Hudson Motor Car Co., Detroit, is now general manager of the Cole Motor Car Co., Indianapolis, Ind.

**Boring Tractor to Build**—The Boring Tractor Corp., Rockford, Ill., has outgrown its present facilities and has bought six acres on which to erect a plant. It is hoped to have the first unit of the new series of buildings ready by May 1.

**Grant Declares Dividend**—The Grant Motor Car Corp. has declared a quarterly dividend of 1½ per cent on preferred stock, payable Feb. 1, to stockholders of record Jan. 20, and also the initial dividend of 1 per cent on the common stock, payable March 1, to stockholders of record Feb. 18. The company recorded the most prosperous year in its history.

**E. W. Clark to Advertise Axles**—Lieut. Ezra W. Clark, having received his discharge from the Air Service, has become advertising manager for the Clark Equipment Co., Buchanan, Mich. Mr. Clark was for many years editor of the Chicago Inter Ocean and later business manager of the Mobile Item, and advertising manager of the Memphis News-Scimitar.

**Pierce Governor Adds to Plant**—The Pierce Governor Co., Anderson, Ind., has completed a two-story addition to its factory, which gives 5000 sq. ft. additional floor space. The new addition will be used for storing raw material and finished parts, and the tool making department and pattern making department will also be moved into it. This will release considerable space in the main factory building for the additional machinery and assembly benches necessitated by growing business.

**To Re-Employ Men in Service**—The board of directors of the J. I. Case Plow Works has adopted the following resolution: Resolved, That all employees of the J. I. Case Plow Works, who left their positions for military service, at home or abroad, will be given re-employment at a compensation at least equal to what they were receiving when they left their positions, provided that such employees desire to return and makes application and report for duty within thirty days after honorable discharge. The same policy will be followed by the Wallis Tractor Co.

**Illinois Tractor Plans Expansion**—The Illinois Tractor Co., Bloomington, Ill., has let the contract for a new testing building, to be equipped with two dynamometers, which will be used to test the engine and drawbar pull of all completed machines before going to the paint shop for the final stage. Plans have been drawn for a new machinery building, which will be an adjunct to the present main building and which will be completed this year. Increasing business forces an expansion. Between 1500 and 2000 tractors will be constructed during 1919, the company says.

**Spokane Dealers Review Work**—A year ago the Spokane Automobile Chamber of Commerce was organized by a few enthusiastic car and accessory dealers. There are now twenty-three active members in the association and thirty-nine associate members. Some of the important things accomplished and sponsored by the association during the year are: Closed all salesrooms Sundays and evenings; indorsed good roads association plan to complete Sunset highway during 1919; the club subscribed for \$500 worth of thrift stamps; subscribed \$1,200 and bought armored motor car, which was presented to Company L, Washington national guard; subscribed \$500 for the Red Cross in its last drive. Already plans are under way for a 1920 progressive automotive show, on account of the success of their first attempt. This will be

staged on a much larger scale. Harry Twitchell is president.

**Haines Moves Up at Dodge**—F. A. Haines is the new general manager for Dodge Brothers, Detroit. He was promoted from factory manager. A. Z. Mitchell, his former assistant, succeeds him as factory manager.

**Trade Association Broadens Name**—The Bloomington trade association is now the Bloomington Automobile and Tractor Association, due to the decision to admit dealers in trucks, tractors and accessories to membership. It was voted to postpone the proposed show until April 1.

**Lansing Automotive Leader Dead**—Harry E. Bradner, general manager of the Auto Body Co. since that corporation was started in 1901 and later president of the concern, died of pneumonia recently. He was also vice-president of the Duplex Truck Co., the Gier Pressed Steel Co. and the Auto Wheel Co., all of Lansing. Mr. Bradner is credited with starting the Auto Body Co., with a capital stock of \$20,000, which recently was increased to \$2,000,000. He was president of this company until a few weeks ago.

**Republic Truck Distributors Organize**—Twelve leading distributors of the Republic Motor Truck Co. met at the plant recently for an informal conference to discuss the sales plans for the coming year. When the conference ended the distributors had organized the Republic Distributors' Association. The company, while running below capacity, is completing 1000 jobs a month and will increase this as soon as the material situation clears up. The last war contract will be finished by the end of February.

**Nash Pays Extra Dividend**—In addition to the regular 7 per cent dividend on preferred, the Nash Motors Co. has declared a total of \$21 a share on common. An initial dividend of \$6 a share on common was paid Feb. 1, and another common dividend of \$10 per share is payable Feb. 15. The Nash business for 1918 amounted to \$41,000,000, including the production of about 21,000 cars and trucks. It is planned for 1919 to build 25,000 cars and as many trucks as conditions warrant.

**Used Car Men Organize**—To raise the business standard of the membership and protect prospective customers against unscrupulous dealers, twenty-five used car dealers have organized the Los Angeles Used Car Dealers' Association. It already has been proposed to hold a used car show as a means of bringing to public attention the high-grade stock to be had on the market. The following officers have been elected: M. A. Leach, president; Spencer Kennelly, vice-president; F. B. Calvert, secretary; M. C. Iverson, treasurer.

**New Officers for Turnbull Motors**—A. F. Mitchell was elected president of the Turnbull Motor Truck & Wagon Co., Defiance, Ohio, at the company's annual meeting. He succeeds W. O. Allen, general manager of the Allen Motor Car Co., Fostoria, who continues as a member of the board of directors. Other officers are: Vice-President, R. G. Holgate; treasurer and general manager, Charles C. German; secretary, L. J. Spafford; general sales manager, W. L. Krapp; advertising manager, George A. Wieland; chief engineer, H. K. Rienoehl.

**Big Distributer Meeting on Coast**—Eighty sub-dealers, representing the Greer-Robbins Co., distributor for the Hupmobile and Chalmers, gathered at Los Angeles recently for the annual convention and banquet. Dealers were present from throughout California and Arizona. This was the fifth event of the kind, and as a means for getting together an organization of this size and importance to the business the distributors believe it is the most successful method that can be devised. The

dealers were optimistic and predict 1919 will see a normal demand in their parts of the territory. A few have become identified with tractors within recent months and declare more power-farming implements will be used this year than ever.

**Snowhook Now with Nash**—R. J. Snowhook, formerly with Willys-Overland, now is connected with the advertising department of the Nash Motors Co., Kenosha, Wis.

**Lodge Heads Candler Radiator**—The Candler Radiator Co. has elected the following officers: President, John C. Lodge; vice-president, George V. Candler; secretary and manager, John A. Hinger.

**Studebaker Declares Dividends**—The Studebaker Corp., South Bend, Ind., has declared a 1 per cent dividend on common and 1½ per cent on preferred, payable March 1 to stockholders of record Feb. 20.

**Cooper Now with Walker**—J. H. Cooper, formerly vice-president of the Endurance Tire & Rubber Co., has joined the sales force of the Walker Mfg. Co., Racine, Wis., as eastern sales manager.

**Hertzler with Long Island Concern**—John Hertzler has been elected secretary and treasurer of the Pressed & Welded Steel Products Co., Long Island City, N. Y. He was formerly assistant manager of the Bearings Co. of America, Lancaster, Pa.

**Grant Motors Gains \$450,000**—The net earnings of the Grant Motor Car Corp. for the year ended Dec. 31 were in excess of \$450,000 after paying the preferred dividends, which left a balance of more than 20 per cent on common stock.

**Sommer Leaves Factory**—L. A. Sommer, for four years factory manager of the Allen Motor Car Co., Fostoria, Ohio, has resigned his position to head the Sommer-Adams Co., Cleveland, which will design and manufacture special jigs, tools and fixtures, concentrating on car and parts work and acting as consulting engineers.

**Trippensee Buys Wolverine Plant**—The Trippensee Mfg. Co., makers of motorcar bodies, has bought the plant of the Wolverine Mfg. Co. The property covers 6½ acres with 250,000 sq. ft. floor space and two railroad sidings. The company already has taken possession and it is understood it will commence production at once on closed body work, providing employment for 1600 men.

**Lee Tire Earns \$30,000 More**—The Lee Rubber & Tire Corp. showed earnings of \$250,000 for 1918 as compared with \$220,000 for 1917, after all necessary deductions were made. Sales for January, 1919, are about 30 per cent larger than for the same month last year. Although the company's financial position is understood to be good, there are no prospects of a disbursement to the stockholders for some time.

**Swinehart Declares Extra Dividend**—The Swinehart Tire & Rubber Co. has authorized the payment of a dividend of 2 per cent in cash April 15 to stockholders of record March 31, also an extra 10 per cent in preferred stock March 5 to stockholders of record Feb. 20. These are the first dividends on common stock authorized since Oct. 15, 1917. Sales in 1918 amounted to \$3,910,000, an increase of 100 per cent over those of 1917. Net earnings, it is said, amounted to \$500,000.

**Hartford Automotive Parts Co.**—Negotiations have been consummated for the consolidation of the Hartford Auto Parts Co. and the Kinsler-Bennett Co., both manufacturers of universal joints and drives. The new company has been incorporated as the Hartford Automotive Parts Co., with a capital of \$1,500,000. No change in management is contemplated other than a consolidation of the personnel of those identified with the former companies and the association of Hollister, White & Co., bankers of Boston, who have a financial interest in the new company.

# From the Four Winds

## Glimpses at the World of Motordom

**GASOLINE Substitute in Greece**—Due to a shortage of petroleum in Greece, a substitute called motorine has been produced. It comprises spirits of turpentine twice refined, or a mixture of alcohol and turpentine in proportions of 85 to 15. It has been very successfully used in Diesel petroleum engines.

**Association Fights Glass Thrown in Road**—The Delaware Automobile Association has begun an aggressive campaign against the throwing of glass in the streets and roads of the state. The authorities are co-operating with the association, several arrests having been made and heavy penalties imposed. The association has offered a reward of \$25

for information that will result in a conviction in any case of this kind.

**Weather Helps Nebraska Road Work**—Extremely mild weather in Nebraska and western Iowa resulted in farmers giving much attention to road-dragging. The work has progressed on a large scale, and many of the highways have been put into excellent condition. Marketing of livestock, particularly hogs, in the Omaha territory has been greatly augmented by the railroad restriction placed upon the number of stock cars allowed shippers of hogs during any one week. One week the allotment for the South Omaha market was used up in five days, during

which the total number of hogs received by the railroad was nearly 200,000. As cold weather is predicted and there is a large amount of livestock marketing yet to be done before the planting season, it is expected the coming month will see tremendous activity in trucking hogs to South Omaha over roads greatly bettered during the mild spell.

**Michigan Receipts for Registrations**—Net receipts from licenses in Michigan during 1918 were \$2,875,266. Of this amount \$2,534,711 came from passenger cars and the balance from commercial cars, motorcycles, manufacturers' and dealers' licenses. The count shows Michigan cars average one to twelve inhabitants. In 1912 Michigan had one car to every seventy-two. Michigan 1918 receipts were distributed as follows: Counties, \$1,395,857; state highway fund, \$1,395,357; state highway fund fees, \$83,550. The fees are chauffeur licenses, transfers, duplicates, etc.

**Gleaned at Tractor Schools**—One farmer had owned his tractor seven years. He decided that the magneto needed cleaning. He soaked it in gasoline, then turned it to see if it would spark. It did. The magneto was burned up. Another tractor owner heard a fearful noise as the drive wheel turned over. Instead of stopping at once to investigate, he kept going to "see if it would make that noise again." A lug had come loose, and on the second turn-over it swung out and stripped off a control lever and a fender. The farmer was convinced that something must have been wrong.

**Motors in Use by Switzerland**—Statistics of the Automobile Club of Switzerland at the end of 1917 show there were 6140 motor vehicles in Switzerland, of which 4934 were touring cars and 1206 motor trucks. There were fifteen firms in the Helvetic confederation, and these had produced 2565 of the total number, the remaining 3575 representing forty-three foreign makes. Fiat is the foreign firm with the largest number of vehicles in Switzerland, 283 touring cars and fifteen trucks. Of the foreign nations supplying vehicles France comes first, Germany second, America third, Italy fourth and Belgium fifth. British cars are not listed separately.

**Connecticut to Revamp Its Laws**—The Connecticut state legislature is now in session and motor vehicle matters are coming up for discussion. Certain phases of the motor car law are due to be changed, but these changes will make motoring safe in that it is intended to curb the reckless element. Particular attention will be given the matter of car theft. The commissioner of motor vehicles, Robbins B. Stoeckl, is especially interested in this phase, as is also the Automobile Club of Hartford. The legislative committee on roads, rivers and bridges will have all motor vehicle bills referred to it, and hearings will be assigned from time to time to gain an expression from the public. Highway improvements also come under this same jurisdiction, which has ascertained from Highway Commissioner Charles J. Bennett that it will cost \$21,000,000 to complete the trunk line highways, besides a cost of \$3,000,000 a year for maintenance of existing roads. Commissioner Bennett informed the committee 2200 miles of trunk highways remain to be completed.

## Coming Motor Events

### SHOWS

Albany, N. Y.	Automobile Dealers' Association	Feb. 15-22
Cleveland, Ohio	Automobile Trades Association	Feb. 15-22
Rochester, N. Y.	Automobile Dealers' Association	Feb. 15-22
Louisville, Ky.	Auto Dealers' Association, automotive	Feb. 17-22
Newark, N. J.	N. J. Auto Exhibition Co.	Feb. 15-22
Minneapolis, Minn.	Northwestern Automotive Exposition	Feb. 15-22
Des Moines, Iowa	Automobile Dealers' Association, automotive	Feb. 17-22
Grand Rapids, Mich.	Automobile Business Association	Feb. 17-22
South Bethlehem, Pa.	Lehigh Valley Auto Shows Co., cars	Feb. 17-24
St. Louis, Mo.	Manufacturers' and Dealers' Association	Feb. 17-22
Seattle, Wash.	Motor Car Dealers' Association, cars	Feb. 17-22
Wichita, Kan.	Wichita Tractor and Thresher Club	Feb. 18-22
Hartford, Conn.	Automobile Dealers' Association	Feb. 22-March 1
South Bethlehem, Pa.	Lehigh Valley Auto Shows Co., trucks	Feb. 24-27
Springfield, Mass.	Cars and trucks	Feb. 24-March 1
Kansas City, Mo.	Motor Dealers' Association, cars	Feb. 24-March 1
Kansas City, Mo.	Kansas City Tractor Club, tractors	Feb. 24-March 1
Portland, Ore.	Dealers' Motor Car Association	Feb. 24-March 1
Cedar Rapids, Iowa		Feb. 24-March 1
Burlington, Iowa		Feb. 24-March 1
Duluth, Minn.		Feb. 25-March 1
Madison, Wis.	Association of Commerce	Feb. 26-March 1
Quincy, Ill.	Automobile Trades Association, cars	Feb. 26-March 1
Detroit	Automobile Dealers' Association	March 1-8
Quincy, Ill.	Automobile Trades Association, trucks and tractors	March 3-4
Columbus, Ohio	Automobile Show Co.	March 3-8
Buffalo, N. Y.	Automobile Dealers' Association	March 3-8
Little Rock, Ark.	Automobile Dealers' Association	March 5-8
Omaha, Neb.	Automobile Trade Association, automotive	March 10-15
Syracuse, N. Y.	Automobile Dealers' Association	March 10-15
Salt Lake City, Utah	Salt Lake Auto Show	March 10-15
Peoria, Ill.		March 12-15
Boston, Mass.	Automobile Dealers' Association, cars	March 15-22
Harrisburg, Pa.	Motor Dealers' Association	March 15-22
Peoria, Ill.		March 17-18
St. Joseph, Mo.	Automobile Show Association	March 19-22
Brooklyn, N. Y.	Motor Vehicle Dealers' Association, cars	March 22-29
Trenton, N. J.	Auto Trade Association	March 22-29
Pittsburgh, Pa.	Automobile Dealers' Association	March 22-29
Brooklyn, N. Y.	Motor Vehicle Dealers' Association, trucks	April 1-5
Montreal, Canada	Soldiers' Wives' League	April 5-12

### SHOW DATES INDEFINITE

Bridgeport, Conn.	City Battalion	Not Decided
Indianapolis, Ind.	Automobile Trade Association	Not Decided
Philadelphia, Pa.	Automobile Trade Association	March
Philadelphia, Pa.	Motor Truck Association	March
Utica, N. Y.	Motor Dealers' Association	March

### MEETINGS

New York	American Road Builders' Association	Feb. 25-28
Hot Springs, Va.	Automotive Equipment Association	June 2-6

### RACES

Santa Monica, Cal.		March 15
Uniontown, Pa.		May 17
Indianapolis, Ind.	500-Mile Sweepstakes	May 31